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Branch : Mechanical Engineering						
Semester III					(2021-22)	
Subject Code :		**BEA-301**	**MEA-302**	**MEA-303**	**MEA-304**	**MEA-305**
S.No.	Name of Candidate	Mid Sem Test	Mid Sem Test	Mid Sem Test	Mid Sem Test	Mid Sem Test
		Marks - 30	Marks - 30	Marks - 30	Marks - 30	Marks - 30
1	REHAN UL HAQUE	26	26	25	28	27
2	RAKESH SOREN	25	24	26	26	24
3	SHIVAM TIWARI	26	26	24	26	15
4	AFSHER IMAM	25	27	25	25	26
5	SANDEEP VIJAY SHAH	25	26	26	26	27
6	MD IRFAN	26	27	25	27	26
7	RAGHVENDRA KAUSHIK	26	26	24	26	25
8	SOVA RANI DAS	25	27	25	27	24
9	BICKY KUMAR	24	26	26	26	26
10	NAPHIS	26	27	25	27	25
11	ABHISHEK KUMAR	25	25	25	25	24
12	MOHAMMAD ABSAR ALI	25	26	25	26	25
13	RAJIV KUMAR	25	27	26	27	25
14	PIKESH RAJAK	26	25	25	26	24
15	PRASHANT RAJ	25	26	24	27	25
16	KOMAL KUMARI	25	25	25	26	26
17	SWETA KUMARI	26	26	26	25	25
18	JYOTI KUMARI	25	27	26	26	26
19	RAHUL KUMAR CHOUHAN	25	26	24	27	16
20	SWATI SINGH	25	25	25	26	24
21	AKHIL KUMAR PANDEY	25	27	26	26	25
22	ANKIT KUMAR	26	26	25	27	26
23	SUMAN KUMARI SINGH	25	25	24	26	25
24	KULDEEP KUMAR	24	27	25	27	24
25	RAMBABU	25	25	26	26	28
26	CHIRAG SHIKHAR	25	26	25	27	25
27	ATUL KUMAR	26	25	24	26	25
28	UTTAM KUMAR BHANDARI	25	25	25	27	26
29	JAI PRAKASH DHANGAR	25	26	25	26	25
30	HEMANT YADAV	26	27	26	27	25
31	DANEJ AMOL JAGDISH	24	25	27	26	24
32	AMARJEET KUMAR	26	25	26	27	25
33	SUDHIR KUMAR SINGH	26	26	25	26	26
34	SUMIT KUMAR	25	27	27	27	25
35	SUNDAR SAI SINGH	24	25	25	26	24
36	BACHHRAJ LAKRA	25	26	26	26	25
37	VISHAL KUMAR SAINI	25	25	25	26	26
38	AJAY TANDI	26	24	24	26	25
39	AARYAN KUMAR	25	26	25	26	24
40	SHYAM GANDHARE	25	25	26	26	17
41	HARSH SONI	25	24	25	26	16
42	GAJANAN ANAND UCHCHUKAR	25	25	24	27	25
43	SOURABH KUMAR	26	26	25	27	25

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44	ANURAG KUMAR	25	25	26	26	24
45	ANKIT CHAKRABORTY	26	24	25	26	25
46	MD SIRAJUDDIN	22	23	22	22	25
47	SATYA BHAN SINGH	24	23	25	26	25
48	ATHARV BANSOD	25	26	26	25	16
49	VARUN KUMAR	26	24	25	25	25
50	SACHCHIDANAND DIWAKAR	25	25	24	26	25
51	BHAVESH PRAKASH SAINDANE	25	25	25	25	26
52	ANIL KUMAR	26	24	24	26	25

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Branch : Mechanical Engineering						
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S.No.	Name of Candidate	**PUT Test**	**PUT Test**	**PUT Test**	**PUT Test**	**PUT Test**
		Marks - 60	Marks - 60	Marks - 60	Marks - 60	Marks - 60
1	REHAN UL HAQUE	51	55	54	48	51
2	RAKESH SOREN	52	54	55	46	55
3	SHIVAM TIWARI	55	55	53	48	22
4	AFSHER IMAM	51	53	52	44	54
5	SANDEEP VIJAY SHAH	52	52	55	55	52
6	MD IRFAN	55	55	51	54	54
7	RAGHVENDRA KAUSHIK	54	51	52	52	52
8	SOVA RANI DAS	55	52	54	54	48
9	BICKY KUMAR	53	54	53	52	46
10	NAPHIS	52	53	54	48	48
11	ABHISHEK KUMAR	55	52	55	46	44
12	MOHAMMAD ABSAR ALI	51	55	53	48	55
13	RAJIV KUMAR	52	54	52	44	54
14	PIKESH RAJAK	54	52	55	55	48
15	PRASHANT RAJ	53	51	51	54	46
16	KOMAL KUMARI	52	53	52	52	48
17	SWETA KUMARI	55	56	54	54	44
18	JYOTI KUMARI	54	54	53	52	55
19	RAHUL KUMAR CHOUHAN	52	55	52	53	19
20	SWATI SINGH	51	56	55	54	52
21	AKHIL KUMAR PANDEY	53	57	54	52	54
22	ANKIT KUMAR	56	58	52	53	52
23	SUMAN KUMARI SINGH	54	55	51	52	48
24	KULDEEP KUMAR	55	55	53	54	46
25	RAMBABU	56	54	54	48	48
26	CHIRAG SHIKHAR	57	55	55	46	44
27	ATUL KUMAR	58	53	53	48	55
28	UTTAM KUMAR BHANDARI	55	52	52	44	54
29	JAI PRAKASH DHANGAR	51	55	55	55	52
30	HEMANT YADAV	49	51	51	54	48
31	DANEJ AMOL JAGDISH	48	52	52	52	46
32	AMARJEET KUMAR	46	54	54	54	48
33	SUDHIR KUMAR SINGH	48	53	53	52	44
34	SUMIT KUMAR	44	52	52	53	55
35	SUNDAR SAI SINGH	55	55	55	54	54
36	BACHHRAJ LAKRA	54	54	54	52	52
37	VISHAL KUMAR SAINI	52	52	52	53	54
38	AJAY TANDI	54	51	54	52	52
39	AARYAN KUMAR	52	53	55	54	48
40	SHYAM GANDHARE	53	56	53	54	22

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41	HARSH SONI	54	54	52	55	21
42	GAJANAN ANAND UCHCHUKAR	52	55	55	54	44
43	SOURABH KUMAR	53	56	51	53	55
44	ANURAG KUMAR	52	57	52	52	54
45	ANKIT CHAKRABORTY	54	58	54	51	52
46	MD SIRAJUDDIN	53	57	51	50	51
47	SATYA BHAN SINGH	52	51	52	52	52
48	ATHARV BANSOD	54	49	55	51	19
49	VARUN KUMAR	53	48	54	53	54
50	SACHCHIDANAND DIWAKAR	52	46	52	56	52
51	BHAVESH PRAKASH SAINDANE	51	48	51	54	53
52	ANIL KUMAR	52	44	53	55	51

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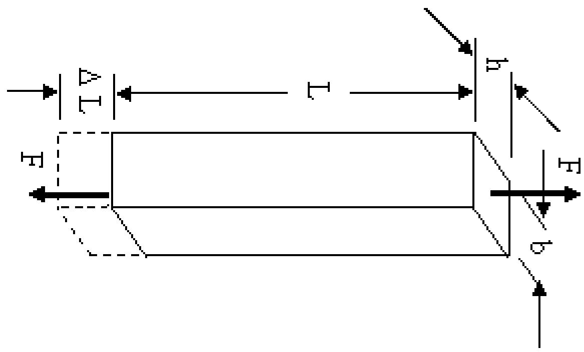
DEPARTMENT OF MECHANICAL ENGINEERING

STRENGTH OF MATERIALS (MEA- 305)

Assignment

Q 1 A steel rod 1 m long and 20 mm x 20 mm in cross-sectional is subjected to a tensile force of 40 kN. Determine the elongation of the road, if modulus of elasticity for the rod material is 200000 MPa.



Q.2 A square steel rod 20mmx20mm in section is to carry an axial load (compressive) of 100 kn. Calculate the shortening in a length of 50 mm.E=2014x10^8kn/m^2.

Q3 Write the procedure for draw Mohr circle for stresses on an oblique section of a body subjected to direct stresses in two mutually perpendicular directions.

Q.4A point in a strained material is subjected to the stresses as shown in fig. .find graphically or otherwise the normal and shear stress on the section AB.

Q5 Prove the Bending equation with assumption.A cantilever beam of 1.5 m span is loaded as shown in fig.Draw the shear force and bending moment diagrams.

Q6 Prove the torsion equation with assumption.

Q.7A hollow steel shaft of 300mm external diameter and 200 mm internal diameter has to be replaced by a solid steel shaft . Assuming the same values of polar modulus for both , calculate the diameter of the latter and work out the ratio of their torsional rigidities. Take C for steel as 2.4 C for alloy.

Q8 What is column and its types. Derive Rankine's formula for columns.

Q.9 Explain Strain energy theory with diagram.

Q .10 Stress strain diagram
Q.11 Ductile and brittle fracture
Q.12 Bending of beams
Q.13 Shafts in series
Q.14 Maximum principal stress theory

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DEPARTMENT OF MECHANICAL ENGINEERING

STRENGTH OF MATERIALS

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UNIT I

STRESSES AND STRAINS

(SIMPLE & PRINCIPAL)

Stress is proportional to strain within its elastic limit. This law is known as Hooke's law. The material will not return to original shape if the applied stress is more than E.

$\zeta \, \alpha \, \varepsilon$ Stress - ζ Linear Strain – ε

Therefore, $\zeta = E\varepsilon$ Where E Modulus of Elasticity or Young's Modulus.

$$\zeta = \frac{P}{A}$$

P – Load

A- Area of the section where the load is applied.

Stresses are three types tensile, compressive, and shear stress. Moment and torsion will produced any of these stresses.

Strain is nothing but deformation (change in length, breadth, height, diameter, therefore area or volume) of the body or material due to load. Therefore strain is change in dimension to the original dimension. It may be length or volume.

$$\varepsilon = \frac{\delta L}{L}$$

δL – Change in length

L – Original length

Therefore by substituting the value of ζ and ε in the Hook's law. Change in length is

$$\delta L = \frac{PL}{AE}$$

$$\delta L = \frac{4PL}{Ed1d2}$$ uniformly varying circular section Π

$$\delta L = \frac{PL}{Et(a-b)} \log e(a/b)$$ uniformly varying rectangular section a>b

This is the fundamental equation to find change in length of any type of section or step section using principle of superposition method of varying load, length, area, and material. The change in length due to compressive load is taken as negative and positive for tensile load.

Units :

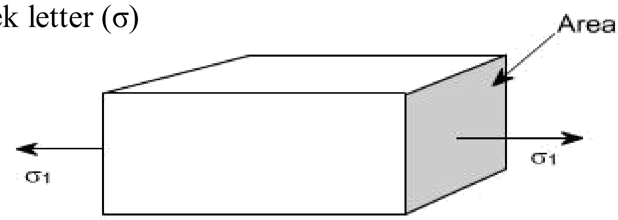
The basic units of stress in S.I units i.e. (International system) are N / m^2 (or Pa) MPa = 10^6 Pa GPa = 10^9 Pa

KPa = 10^3 Pa

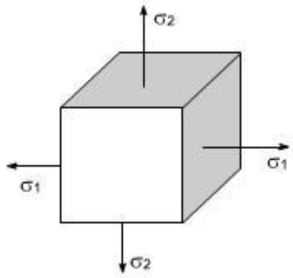
Sometimes N / mm^2 units are also used, because this is an equivalent to MPa. While US customary unit is pound per square inch psi.

<u>TYPES OF STRESSES :</u> Only two basic stresses exists : (1) normal stress and (2) shear stress. Other stresses either are similar to these basic stresses or are a combination of this e.g. bending stress is a combination tensile, compressive and shear stresses. Torsional stress, as encountered in twisting of a shaft is a shearing stress. Let us define the normal stresses and shear stresses in the following sections.

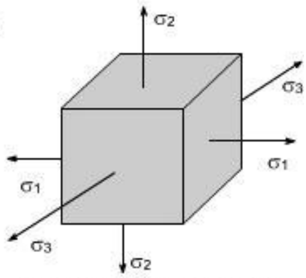
Normal stresses : We have defined stress as force per unit area. If the stresses are normal to the areas concerned, then these are termed as normal stresses. The normal stresses are generally denoted by a Greek letter (σ)



This is also known as uniaxial state of stress, because the stresses acts only in one direction however, such a state rarely exists, therefore we have biaxial and triaxial state of stresses where either the two mutually perpendicular normal stresses acts or three mutually perpendicular normal stresses acts as shown in the figures below :



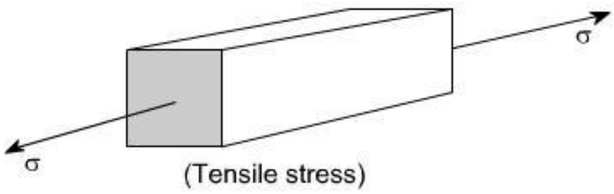
(Biaxial state of stress)



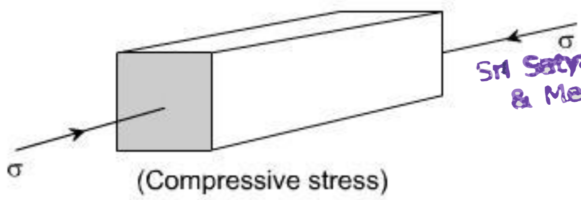
(Triaxial state of stress)

Tensile or compressive Stresses:

The normal stresses can be either tensile or compressive whether the stresses acts out of the area or into the area



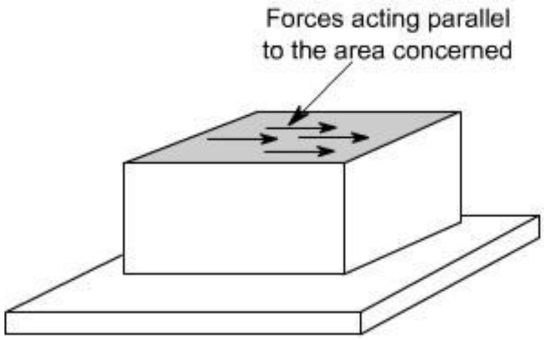
(Tensile stress)



(Compressive stress)

Shear Stresses:

Let us consider now the situation, where the cross – sectional area of a block of material is subject to a distribution of forces which are parallel, rather than normal, to the area concerned. Such forces are associated with a shearing of the material, and are referred to as shear forces. The resulting stress is known as shear stress.



<u>Deformation of a Body due to Self Weight</u>

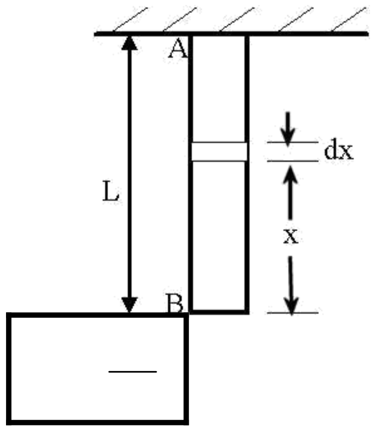
Consider a bar AB hanging freely under its own weight as shown in the figure.

Let

L= length of the bar

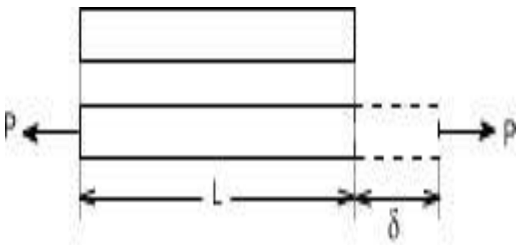
A= cross-sectional area of the bar

E= Young's modulus of the bar material w=
Specific weight of the bar material
Then deformation due to the self-weight of the bar



Members in Uni – axial state of stress

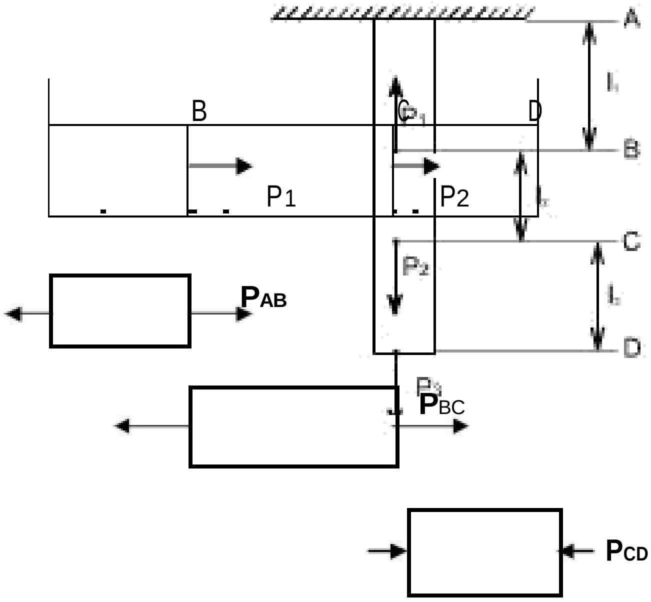
For a prismatic bar loaded in tension by an axial force P, the elongation of the bar can be determined as



$$\delta = \frac{PL}{AE} \quad \text{——— (1)}$$

Suppose the bar is loaded at one or more intermediate positions, then equation

(1) can be readily adapted to handle this situation, i.e. we can determine the axial force in each part of the bar i.e. parts AB, BC, CD, and calculate the elongation or shortening of each part separately, finally, these changes in lengths can be added algebraically to obtain the total charge in length of the entire bar.



Principle of Superposition

The principle of superposition states that when there are numbers of loads are acting together on an elastic material, the resultant strain will be the sum of individual strains caused by each load acting separately.

Types of problem

Both ends are free (to expand or shrink) determinate structure:

Total change in length is equal to algebraic sum of change in length of each section of its load P, length L, Area A, and Young's modulus E. These parameters may vary from section to section. The material is free to expand and shrink.

$$\delta L = \delta 1 + \delta 2 + \delta 3 + \ldots + \delta n$$

P1 **P4**

Both ends are fixed (cannot expand or shrink) indeterminate structure:

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Total change in length is zero because the ends are fixed which will not allow the sections to expand or shrink. Load or stress is produced by expansion or shrinkage of the section is taken by the ends. Therefore ends carry some load or stress.

Using principle of superposition the reactions at the end of each section is found from free body diagram. Equate the direction of force in free body diagram to force applied for each section, A

PAB- PBc= P1

PBC + PCD = P2Equations – (A)

The equation shows that the section AB and BC is under tension and CD under compression. The direction of load in each section can be chosen as we desire, but if the final result is negative then the direction chosen is incorrect but the answer is correct. So in other words tensile force is actually a compressive force vice versa.

Sum of change in length of each section due to expansion is equal to sum of change in length of each section due to compression. The load P, length L, Area A, and Young's modulus E parameters may vary from section to section.

Expansion section = Compression section

δ1+ δ2+....+ δn= δ3+ δ4+ …..+ δn Equations – (B)

Using equation A and B the problem can be solved.

Composite Material of Equal length

Reinforced Columns, Supporting load, Suspended load, Composite structure of equal length (example pipe inside a pipe) these problems can be solved with the following expression.

The change length is same for all materials in that structure. Example in reinforced concrete column (RCC), steel and concrete length change equally, similarly for supporting load,
suspended load, and composite structure of equal length. Therefore to solve these problems use the following expressions.

Change in length of concrete = change in length of steel δlc= δlsEquation – (A)

It is same as equation below for equal length only

$$\frac{\zeta c}{Ec} = \frac{\zeta s}{Es}$$

For unequal length it is

$$\frac{\zeta cLc}{Ec} = \frac{\zeta sLs}{Es}$$

The load P may be shared by two material equally or unequally.

P = Pc+ PsP is Total load, Pcload taken by concrete and Ps steel. Or P = Acζc+ Asζs(B)

When the lengths of the composite material are equal by substituting B in A, find the stresses in the materials.

The ratio of Es/ Ec is known as modular ratio

Composite Material of Unequal length tubular section

1. Find the material or section whose length is shorter or longer than other material.
1. Calculate the load required to make the section of equal length using formula of δl.
2. This will give the remaining load that will be shared by both the sections.
3. At this point onwards it is similar to composite material of equal length.

Bolt and Nut:

Load in bolt = Load in tube

$$\zeta_b A_b = \zeta_t A_t$$

Change in length is sum of change in length in bolt and change in length in tube.

$$\delta = \delta b + \delta t$$

Thermal Stresses:

$$\frac{\delta l}{} = \frac{l\,\alpha t - \ -}{} \quad \text{Equation (C)}$$

When there is increase in temperature the material expands this will produce stress. This is known as thermal stress.

$$\delta l = L\,\alpha t$$

Thermal stresses when the material is not allowed to expand:

$$\varepsilon = \frac{\delta l}{L} = \alpha t \text{ ---------Equation (A)}$$

$$\zeta = E\varepsilon \text{ ---------Equation (B)}$$

Substituting A in B

$$\zeta = E\,\alpha t$$

Thermal stresses when the material is allowed to expand to a length Δ:

$$\delta l = l\,\alpha t -$$

$$\varepsilon =$$

Therefore stress is $\zeta = E\varepsilon$.

Thermal Stresses in composite bars:

Therefore load in brass is equal to load in steel because temperature is assumed to be uniform.

$$\zeta_s A_s = \zeta_b A_b \quad \text{- (A)}$$

Change lengths are therefore strains are equal thus,

$$\frac{\alpha bt - \zeta b}{Eb} = \frac{\alpha st + \zeta s}{Es} \quad \text{----------Equation}$$

Substituting equation A in B to find the stresses in the material.

When the thermal coefficient of one material is larger than the other then that material will be under compression and the other material will be under tension. Thus brass is under compression and steel is under tension in our example.

Volumetric Strain:

Change in volume to the original volume is known as volumetric strain.

Poisson ratio: It is the ratio of lateral strain to the linear strain. It is denoted by symbol **μ**

$$\mu = \frac{\text{lateral strain}}{\text{linear strain}} \quad \text{or} \quad m = \frac{1}{\mu}$$

Change in volume due to axial load in all three directions for a cube or cuboids

$$\frac{\delta v}{V} = \frac{1}{E}(\zeta x + \zeta y + \zeta z)(1-2\mu)$$

This equation is valid only when all the loads are applied as tensile load. The same equation can be used for the following loads,

1. Compressive load change to minus sign to that direction only for the above formula.
2. Load only in one direction the remaining stresses are zero.
3. Load in two directions the remaining stress is zero.

Change in volume due to axial load for a cylindrical rod

Change in diameter in cylinder is **$\varepsilon c = \delta d/d$**

Change in length in cylinder is **$\varepsilon l = \delta l/l$**

Therefore change in volume of cylindrical rod;

$$\frac{\delta v}{V} = \varepsilon l - 2\varepsilon c$$ (Minus sign lateral strain are compressive forces) **OR**

$$\frac{\delta v}{V} = \frac{1}{E}(\zeta x)(1-2\mu)$$

Where, ζy and ζz are zero because load in one direction only.

Three important moduli's are Elasticity, Bulk, and Rigidity

Modulus of Elasticity

Modulus of Rigidity: Shear stress is proportional to shear strain

Strain Energy in Sudden Load

The stress due to sudden load is found by equating the equation (A) in the following equation.

Strain Energy in Impact Load

U = Load x (height + Change in length)

$1 + \sqrt{1+2Eh(PL)}$

The stress ζ due to impact load when δL is negligible

√2EPh ζ = ---

AL

2 V

The stress ζ due to impact load when δL is not negligible

P

ζ = ------ **A**

Strain energy due to impact load is found by substituting the stress ζ due to impact load in the following equation.

ζ

U = --------- **2E**

Problem

Find the modulus of elasticity for a rod, which tapers uniformly from 30 mm to 15 mm diameter in a length of 350 mm. The rod is subjected to an axial load of 5.5 kN and extension of the rod is 0.025 mm.

Sol. Given :

Larger diameter, $D_1 = 30$ mm

Smaller diameter, $D_2 = 15$ mm

Length of rod, $L = 350$ mm

Axial load, $P = 5.5$ kN $= 5500$ N

Extension, $dL = 0.025$ mm

Using equation (1.10), we get

$$dL = \frac{4PL}{\pi E\, D_1 D_2}$$

or

$$E = \frac{4PL}{\pi\, D_1 D_2\, dL} = \frac{4 \times 5000 \times 350}{\pi \times 30 \times 15 \times 0.025}$$

$$= 217865 \text{ N/mm}^2 \text{ or } 2.17865 \times 10^5 \text{ N/mm}^2.$$ **Ans.**

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Strain:

When a single force or a system force acts on a body, it undergoes some deformation. This deformation per unit length is known as strain. Mathematically strain may be defined as deformation per unit length.

So,

Strain=Elongation/Original length

Elasticity;

The property of material by virtue of which it returns to its original shape and size upon removal of load is known as elasticity.

Hooks Law

It states that within elastic limit stress is proportional to strain. Mathematically

$$E = \frac{Stress}{Strain}$$

Where E = Young's Modulus

Hooks law holds good equally for tension and compression.

Poisson's Ratio;

The ratio lateral strain to longitudinal strain produced by a single stress is known as Poisson's ratio.

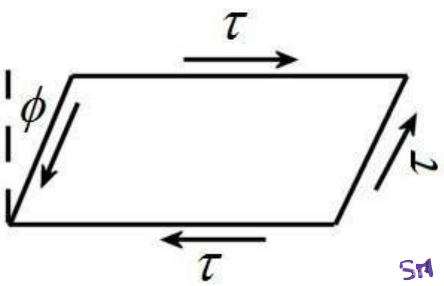
Symbol used for poisson's ratio is *nu* or 1/ *m* .

Modulus of Elasticity (or Young's Modulus)

Young's modulus is defined as the ratio of stress to strain within elastic limit.

Shear Strain

The distortion produced by shear stress on an element or rectangular block is shown in the figure. The shear strain or 'slide' is expressed by angle ϕ and it can be defined as the change in the right angle. It is measured in radians and is dimensionless in nature.



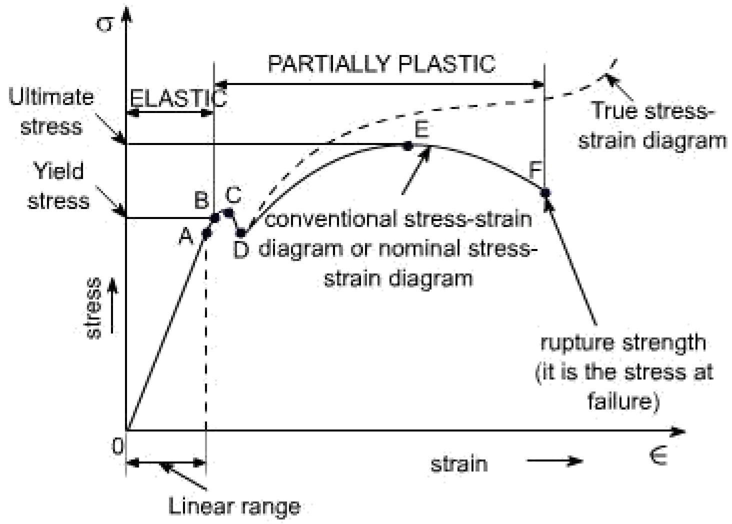
Modulus of Rigidity

For elastic materials it is found that shear stress is proportional to the shear strain within elastic limit.
The ratio is called modulus rigidity. It is denoted by the symbol 'G' or 'C'.

Bulk modulus (K): It is defined as the ratio of uniform stress intensity to the volumetric strain.
It is denoted by the symbol K.

Relation between elastic constants:

Elastic constants: These are the relations which determine the deformations produced by a given stress system acting on a particular material. These factors are constant within elastic limit, and known as modulus of elasticity *E*, modulus of rigidity *G*, Bulk modulus *K* and Poisson's ratio μ.



Relationship between modulus of elasticity (E) and bulk modulus (K):

Relationship between modulus of elasticity (E) and modulus of rigidity (G):

Stress – strain diagram for mild steel

A typical tensile test curve for the mild steel has been shown below

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SALIENT POINTS OF THE GRAPH:

(A) So it is evident form the graph that the strain is proportional to strain or elongation is proportional to the load giving a st.line relationship. This law of proportionality is valid upto a point A.

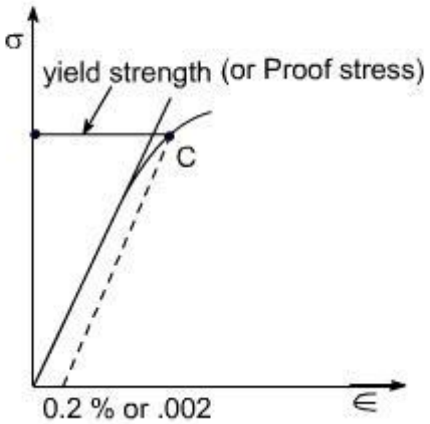
or we can say that point A is some ultimate point when the linear nature of the graph ceases or there is a deviation from the linear nature. This point is known as **the limit of proportionality or the proportionality limit**.

(B) For a short period beyond the point A, the material may still be elastic in the sense that the deformations are completely recovered when the load is removed. The limiting point B is termed as **Elastic Limit** .

(C) and (D) - Beyond the elastic limit plastic deformation occurs and strains are not totally recoverable. There will be thus permanent deformation or permanent set when load is removed. These two points are termed as upper and lower yield points respectively. The stress at the yield point is called the yield strength.

A study a stress – strain diagrams shows that the yield point is so near the proportional limit that for most purpose the two may be taken as one. However, it is much easier to locate the former. For material which do not posses a well define yield points, In order to find the yield point or yield strength, an offset method is applied.

In this method a line is drawn parallel to the straight line portion of initial stress diagram by off setting this by an amount equal to 0.2% of the strain as shown as below and this happens especially for the low carbon steel.



(E) A further increase in the load will cause marked deformation in the whole volume of the metal. The maximum load which the specimen can with stand without failure is called the load at the ultimate strength.

The highest point ‘E' of the diagram corresponds to the ultimate strength of a material.

s_u = Stress which the specimen can with stand without failure & is known as Ultimate Strength or

Tensile Strength.

s_u is equal to load at E divided by the original cross-sectional area of the bar.

(F) Beyond point E, the bar begins to forms neck. The load falling from the maximum until fracture occurs at F. Beyond point E, the cross-sectional area of the specimen begins to reduce rapidly over a relatively small length of bar and the bar is said to form a neck. This necking takes place whilst the load reduces, and fracture of the bar finally occurs at point F.

Nominal stress – Strain OR Conventional Stress – Strain diagrams:

Stresses are usually computed on the basis of the original area of the specimen; such stresses are often referred to as conventional or nominal stresses.

True stress – Strain Diagram:

Since when a material is subjected to a uniaxial load, some contraction or expansion always takes place. Thus, dividing the applied force by the corresponding actual area of the specimen at the same instant gives the so called true stress.

Percentage Elongation: 'd ':

The ductility of a material in tension can be characterized by its elongation and by the reduction in area at the cross section where fracture occurs.

It is the ratio of the extension in length of the specimen after fracture to its initial gauge length, expressed in percentage.

$$\delta = \frac{(l_1 - l_g)}{l_1} \times 100$$

l_I = gauge length of specimen after fracture(or the distance between the gage marks at fracture)

l_g= gauge length before fracture(i.e. initial gauge length)

For 50 mm gage length, steel may here a % elongation d of the order of 10% to 40%.

Ductile and Brittle Materials:

Based on this behaviour, the materials may be classified as ductile or brittle materials

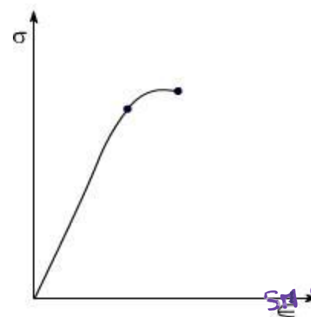
Ductile Materials:

It we just examine the earlier tension curve one can notice that the extension of the materials over the plastic range is considerably in excess of that associated with elastic loading. The Capacity of materials to allow these large deformations or large extensions without failure is termed as ductility. The materials with high ductility are termed as ductile materials.

Brittle Materials:

A brittle material is one which exhibits a relatively small extensions or deformations to fracture, so that the partially plastic region of the tensile test graph is much reduced.

This type of graph is shown by the cast iron or steels with high carbon contents or concrete.



Mechanical Properties of material:

Elasticity: Property of material by virtue of which it can regain its shape after removal of external load

Plasticity: Property of material by virtue of which, it will be in a state of permanent deformation even after removal of external load.

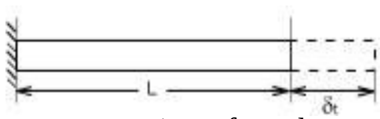
Ductility: Property of material by virtue of which, the material can be drawn into wires.

Hardness: Property of material by virtue of which the material will offer resistance to penetration or indentation

Thermal stresses, Bars subjected to tension and Compression

Compound bar: In certain application it is necessary to use a combination of elements or bars made from different materials, each material performing a different function. In over head electric cables or Transmission Lines for example it is often convenient to carry the current in a set of copper wires surrounding steel wires. The later being designed to support the weight of the cable over large spans. Such a combination of materials is generally termed compound bars.

Compound bars subjected to Temp. Change : Ordinary materials expand when heated and contract when cooled, hence , an increase in temperature produce a positive thermal strain. Thermal strains usually are reversible in a sense that the member returns to its original shape when the temperature return to its original value. However, there here are some materials which do not behave in this manner. These metals differs from ordinary materials in a sence that the strains are related non linearly to temperature and some times are irreversible .when a material is subjected to a change in temp. is a length will change by an amount.



= coefficient of linear expansion for the material L = original Length

t = temp. change

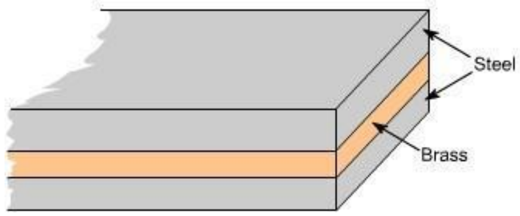
Thus an increase in temperature produces an increase in length and a decrease in temperature results in a decrease in length except in very special cases of materials with zero or negative coefficients of expansion which need not to be considered here.

If however, the free expansion of the material is prevented by some external force, then a stress is set up in the material. They stress is equal in magnitude to that

which would be produced in the bar by initially allowing the bar to its free length and then applying sufficient force to return the bar to its original length.

Consider now a compound bar constructed from two different materials rigidly joined together, for simplicity.

Let us consider that the materials in this case are steel and brass.



If we have both applied stresses and a temp. change, thermal strains may be added to those given by generalized hook's law equation –e.g.

$$\in_x = \frac{1}{E}\left[\sigma_x - \gamma(\sigma_y + \sigma_z)\right] + \alpha\Delta t$$

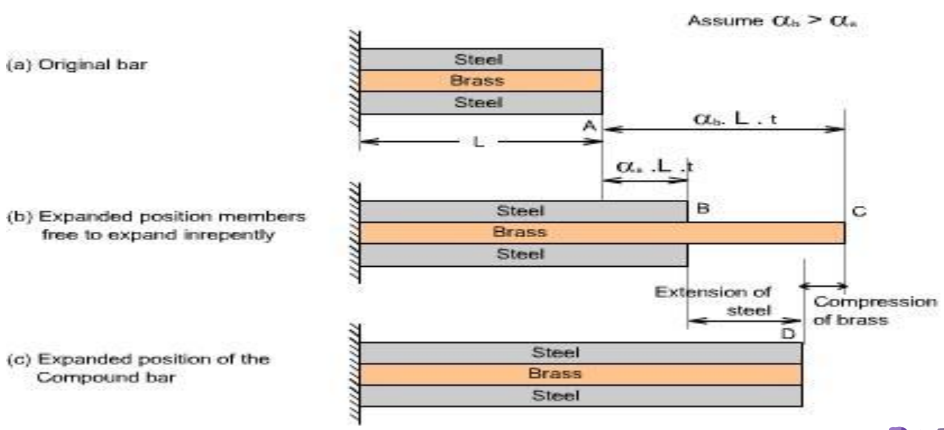
$$\in_x = \frac{1}{E}\left[\sigma_y - \gamma(\sigma_x + \sigma_z)\right] + \alpha\Delta t$$

$$\in_x = \frac{1}{E}\left[\sigma_z - \gamma(\sigma_x + \sigma_y)\right] + \alpha\Delta t$$

While the normal strains a body are affected by changes in temperatures, shear strains are not. Because if the temp. of any block or element changes, then its size changes not its shape therefore shear strains do not change.

In general, the coefficients of expansion of the two materials forming the compound bar will be different so that as the temp. rises each material will attempt to expand by different amounts. Figure below shows the positions to which the

individual materials will expand if they are completely free to expand (i.e not joined rigidly together as a compound bar). The extension of any Length L is given by L t



In general, changes in lengths due to thermal strains may be calculated form equation $_t$ = Lt, provided that the members are able to expand or contract freely,

a situation that exists in statically determinates structures. As a consequence no stresses are generated in a statically determinate structure when one or more members undergo a uniform temperature change. If in a structure (or a compound bar), the free expansion or contraction is not allowed then the member becomes s statically indeterminate, which is just being discussed as an example of the compound bar and thermal stresses would be generated.

If the two materials are now rigidly joined as a compound bar and subjected to the same temp. rise, each materials will attempt to expand to its free length position but each will be affected by the movement of the other. The higher coefficient of expansion material (brass)

Problem 1 *Find the modulus of elasticity for a rod, which tapers uniformly from 30 mm to 15 mm diameter in a length of 350 mm. The rod is subjected to an axial load of 5.5 kN*

Problem 1 *Find the modulus of elasticity for a rod, which tapers uniformly from 30 mm to 15 mm diameter in a length of 350 mm. The rod is subjected to an axial load of 5.5 kN and extension of the rod is 0.025 mm.*

Sol. Given :

Larger diameter, $D_1 = 30$ mm

Smaller diameter, $D_2 = 15$ mm

Length of rod, $L = 350$ mm

Axial load, $P = 5.5$ kN $= 5500$ N

Extension, $dL = 0.025$ mm

Using equation (1.10), we get

$$dL = \frac{4PL}{\pi E\, D_1 D_2}$$

or

$$E = \frac{4PL}{\pi\, D_1 D_2\, dL} = \frac{4 \times 5000 \times 350}{\pi \times 30 \times 15 \times 0.025}$$

$$= \mathbf{217865\ N/mm^2\ or\ 2.17865 \times 10^5\ N/mm^2.}\quad \textbf{Ans.}$$

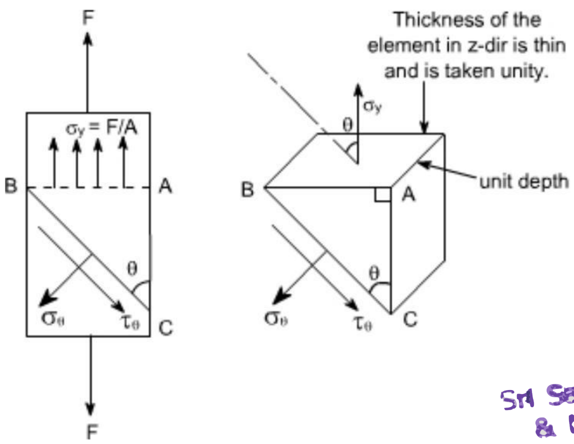
$$\tau_\theta = \frac{1}{2}.\sigma_y \sin 2\theta \qquad (2)$$

If θ = 90^0 the BC will be parallel to AB and τ_θ = 0, i.e. there will be only direct stress or normal stress.

<u>Stresses on oblique plane:</u> Till now we have dealt with either pure normal direct stress or pure shear stress. In many instances, however both direct and shear stresses acts and the resultant stress across any section will be neither normal nor tangential to the plane. A plane stse of stress is a 2 dimensional stae of stress in a sense that the stress components in one direction are all zero i.e

z = yz = zx = 0

Examples of plane state of stress include plates and shells. Consider the general case of a bar under direct load F giving rise to a stress $_y$ vertically



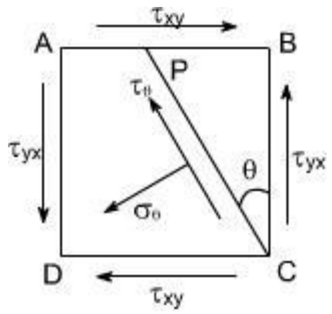
The stress acting at a point is represented by the stresses acting on the faces of the element enclosing the point. The stresses change with the inclination of the planes passing through that point i.e. the stress on the faces of the element vary as the angular position of the element changes. Let the block be of unit depth now considering the equilibrium of forces on the triangle portion ABC. Resolving forces perpendicular to BC.

$\sigma_\theta . BC.1 = \sigma_y \sin\theta . AB.1$

but $AB/BC = \sin\theta$ or $AB = BC \sin\theta$

Material subjected to pure shear:

Consider the element shown to which shear stresses have been applied to the sides AB and DC



Complementary shear stresses of equal value but of opposite effect are then set up on the sides AD and BC in order to prevent the rotation of the element. Since the applied and complementary shear stresses are of equal value on the x and y planes. Now consider the equilibrium of portion of PBC

Assuming unit depth and resolving normal to PC or in the direction of σ_θ

$\sigma_\theta .PC.1 = \tau_{xy} .PB.\cos\theta .1 + \tau_{xy} .BC.\sin\theta .1$

$= \tau_{xy} .PB.\cos\theta + \tau_{xy} .BC.\sin\theta$

Now writing PB and BC in terms of PC so that it cancels out from the two sides

$PB/PC = \sin\theta \quad BC/PC = \cos\theta$

$\sigma_\theta .PC.1 = \tau_{xy} .\cos\theta \sin\theta PC + \tau_{xy} .\cos\theta .\sin\theta .PC$

$\sigma_\theta = 2\tau_{xy} \sin\theta \cos\theta$

Or, $\sigma_\theta = 2\tau_{xy} \sin 2\theta$ (1)

Now resolving forces parallel to PC or in the direction of σ_θ .then τ_{xy} PC.1

$= \tau_{xy} . PB \sin\theta - \tau_{xy} BC \cos\theta$

-ve sign has been put because this component is in the same direction as that of τ_θ .

again converting the various quantities in terms of PC we have

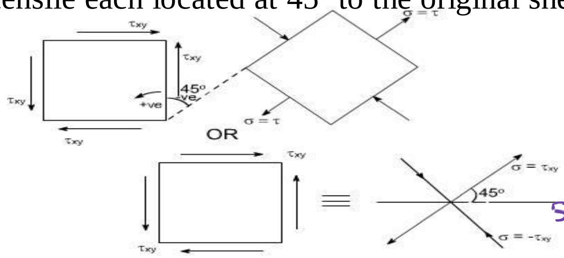
$\tau_{xy} PC. 1 = \tau_{xy} . PB.\sin^2\theta \, \tau_{xy} - \tau_{xy} PC\cos^2\theta$

$= -\tau_{xy} [\cos^2\theta - \sin^2\theta]$

$= -\tau_{xy} \cos 2\theta$ (2)

values of $+\tau_{xy}$ (tension) and $-\tau_{xy}$(compression) on plane at ± 45^0 to the applied shear and on these planes the tangential component τ_θ is zero.

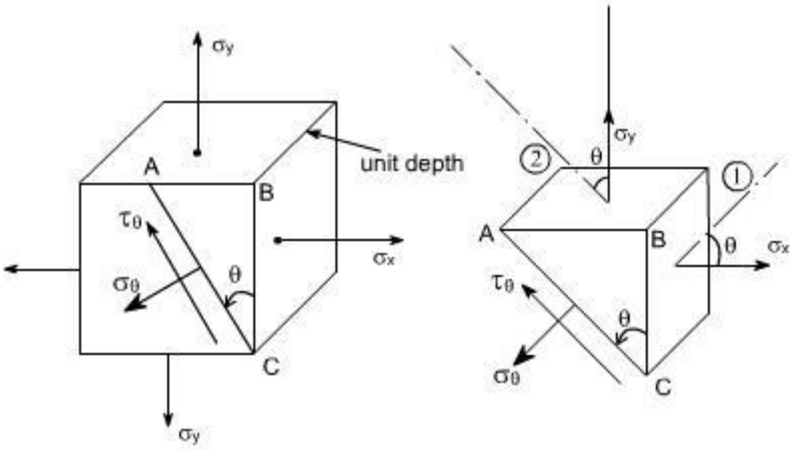
Hence the system of pure shear stresses produces and equivalent direct stress system, one set compressive and one tensile each located at 45^0 to the original shear directions as depicted in the figure below:



$$\sigma_\theta = \left(\frac{\sigma_x + \sigma_y}{2}\right) + \left(\frac{\sigma_x - \sigma_y}{2}\right)\cos 2\theta$$

Material subjected to two mutually perpendicular direct stresses:

Now consider a rectangular element of unit depth, subjected to a system of two direct stresses both tensile, < $_{x}$ and < $_{y}$acting right angles to each other.



(3)

Now resolving parallal to AC

s$_{q}$.AC.1= << $_{xy}$..cos< .AB.1+<< $_{xy}$.BC.sin< .1

The – ve sign appears because this component is in the same direction as that of AC. Again converting the various quantities in terms of AC so that the AC cancels out from the

two sides.

Conclusions :

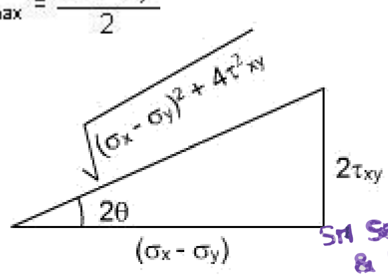
The following conclusions may be drawn from equation (3) and (4)

(i) The maximum direct stress would be equal to < $_{x}$ or < $_{y}$ which ever is the greater, when <

= 0^0 or 90^0

(ii) The maximum shear stress in the plane of the applied stresses occurs when << = 45^0

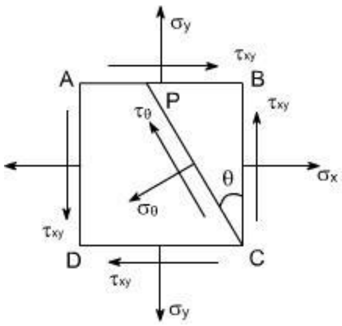
$$\tau_{max} = \frac{(\sigma_x - \sigma_y)}{2}$$



<u>Material subjected to combined direct and shear stresses</u>:

Now consider a complex stress system shown below, acting on an element of material. The stresses < $_{x}$ and < $_{y}$ may be compressive or tensile and may be the result of direct forces or as a result of bending.The shear stresses may be as shown or completely reversed and occur as a result of either shear force or torsion as shown in the figure below:

As per the double subscript notation the shear stress on the face BC should be notified as < $_{yx}$, however, we have already seen that for a pair of shear stresses there is a set of complementary shear



stresses generated such that < $_{yx}$ = < $_{xy}$

By looking at this state of stress, it may be observed that this state of stress is combination of two different cases:

(i) Material subjected to two mutually perpendicular direct stresses. In this case the various formula's derived are as follows.

To get the required equations for the case under consideration, let us add the respective equations for the above two cases such that

These are the equilibrium equations for stresses at a point. They do not depend on material proportions and are equally valid for elastic and inelastic behavior

This eqn gives two values of 2< that differ by 180^0 .Hence the planes on which maximum and minimum normal stresses accurate 90^0apart.

For σ_θ to be a maximum or minimum $\frac{d\sigma_\theta}{d\theta} = 0$

Now

$$\sigma_\theta = \frac{(\sigma_x + \sigma_y)}{2} + \frac{(\sigma_x - \sigma_y)}{2}\cos 2\theta + \tau_{xy}\sin 2\theta$$

$$\frac{d\sigma_\theta}{d\theta} = -\frac{1}{2}(\sigma_x - \sigma_y)\sin 2\theta.2 + \tau_{xy}\cos 2\theta.2$$

$$= 0$$

i.e. $-(\sigma_x - \sigma_y)\sin 2\theta + \tau_{xy}\cos 2\theta.2 = 0$

$\tau_{xy}\cos 2\theta.2 = (\sigma_x - \sigma_y)\sin 2\theta$

Thus, $\boxed{\tan 2\theta = \frac{2\tau_{xy}}{(\sigma_x - \sigma_y)}}$

From the triangle it may be determined
Substituting the values of cos2<< and sin2<< in equation (5) we get

$$\cos 2\theta = \frac{(\sigma_x - \sigma_y)}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$\sin 2\theta = \frac{2\tau_{xy}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$\sigma_\theta = \frac{(\sigma_x + \sigma_y)}{2} + \frac{(\sigma_x - \sigma_y)}{2}\cos 2\theta + \tau_{xy}\sin 2\theta$$

$$\sigma_\theta = \frac{(\sigma_x + \sigma_y)}{2} + \frac{(\sigma_x - \sigma_y)}{2}.\frac{(\sigma_x - \sigma_y)}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}} + \frac{\tau_{xy}.2\tau_{xy}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$= \frac{(\sigma_x + \sigma_y)}{2} + \frac{1}{2}.\frac{(\sigma_x - \sigma_y)^2}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}} + \frac{1}{2}\frac{4\tau^2_{xy}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

or

$$= \frac{(\sigma_x + \sigma_y)}{2} + \frac{1}{2}.\frac{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$= \frac{1}{2}(\sigma_x + \sigma_y) \pm \frac{1}{2}.\frac{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}.\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$\sigma_\theta = \frac{1}{2}(\sigma_x + \sigma_y) \pm \frac{1}{2}.\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

Hence we get the two values of σ_θ, which are designated σ_1 as σ_2 and respectively,therefore

$$\sigma_1 = \frac{1}{2}(\sigma_x + \sigma_y) + \frac{1}{2}.\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

$$\sigma_2 = \frac{1}{2}(\sigma_x + \sigma_y) - \frac{1}{2}.\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

The σ_1 and σ_2 are termed as the principle stresses of the system.
Substituting the values of $\cos 2\theta$ and $\sin 2\theta$ in equation (6) we see that

$$\tau_\theta = \frac{1}{2}(\sigma_x - \sigma_y)\sin 2\theta - \tau_{xy}\cos 2\theta$$

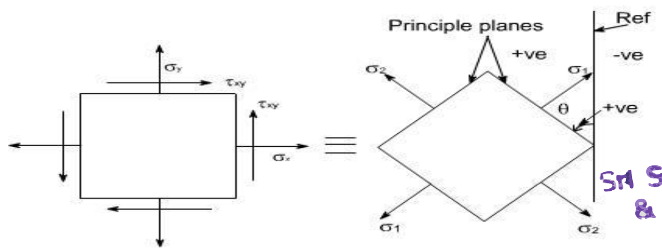
$$= \frac{1}{2}(\sigma_x - \sigma_y)\frac{2\tau_{xy}}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}} - \frac{\tau_{xy}.(\sigma_x - \sigma_y)}{\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}}$$

$$\tau_\theta = 0$$

This shows that the values shear stress is zero on the principal planes.

Once the maximum and minimum values of normal stresses occur on planes of zero shearing stress. The maximum and minimum normal stresses are called the principal stresses, and the planes on which they act are called principal plane the solution of equation ill yield two values of 2< separated by 180^0 i.e. two values of < separated by 90^0 .Thus the two principal stresses occur on mutually perpendicular planes termed principal planes.

Therefore the two – dimensional complex stress system can now be reduced to the equivalent system of principal stresses.



Let us recall that for the case of a material subjected to direct stresses the value of maximum shear stresses

$\tau_{max^m} = \frac{1}{2}(\sigma_x - \sigma_y)$ at $\theta = 45^0$, Thus, for a 2-dimensional state of stress, subjected to principle stresses

$\tau_{max^m} = \frac{1}{2}(\sigma_1 - \sigma_2)$, on substituting the values if σ_1 and σ_2, we get

$$\tau_{max^m} = \frac{1}{2}\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

Alternatively this expression can also be obtained by differentiating the expression for τ_θ with respect to θ i.e.

$$\tau_\theta = \frac{(\sigma_x - \sigma_y)}{2}\sin 2\theta - \tau_{xy}\cos 2\theta$$

$$\frac{d\tau_\theta}{d\theta} = -\frac{1}{2}(\sigma_x - \sigma_y)\cos 2\theta.2 + \tau_{xy}\sin 2\theta.2$$

$$= 0$$

$$\text{or } (\sigma_x - \sigma_y)\cos 2\theta + 2\tau_{xy}\sin 2\theta = 0$$

$$\tan 2\theta_s = \frac{(\sigma_y - \sigma_x)}{2\tau_{xy}} = -\frac{(\sigma_x - \sigma_y)}{2\tau_{xy}}$$

$$\tan 2\theta_s = -\frac{(\sigma_x - \sigma_y)}{2\tau_{xy}}$$

Recalling that

$$\tan 2\theta_p = \frac{2\tau_{xy}}{(\sigma_x - \sigma_y)}$$

Thus,

$$\boxed{\tan 2\theta_p . \tan 2\theta_s = 1}$$

Therefore, it can be concluded that the equation (2) is a negative reciprocal of equation (1) hence the roots for the double angle of equation (2) are 90^0 away from the corresponding angle of equation (1).

This means that the angles that angles that locate the plane of maximum or minimum shearing stresses form angles of 45^0 with the planes of principal stresses.

Further, by making the triangle we get

$$\cos 2\theta = \frac{2\tau_{xy}}{\sqrt{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}}$$

$$\sin 2\theta = \frac{-(\sigma_x - \sigma_y)}{\sqrt{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}}$$

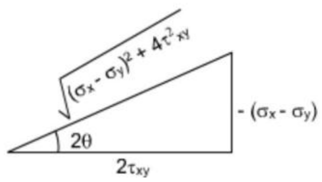
Therefore by substituting the values of $\cos 2\theta$ and $\sin 2\theta$ we have

$$\tau_\theta = \frac{1}{2}(\sigma_x - \sigma_y)\sin 2\theta - \tau_{xy}\cos 2\theta$$

$$= \frac{1}{2}.-\frac{(\sigma_x - \sigma_y).(\sigma_x - \sigma_y)}{\sqrt{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}} - \frac{\tau_{xy}.2\tau_{xy}}{\sqrt{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}}$$

$$= -\frac{1}{2}.\frac{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}{\sqrt{(\sigma_y - \sigma_x)^2 + 4\tau^2_{xy}}}$$

$$\tau_\theta = \pm\frac{1}{2}.\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$



$$\sigma_\theta = \frac{(\sigma_x + \sigma_y)}{2} + \frac{(\sigma_x - \sigma_y)}{2}\cos 2\theta + \tau_{xy}\sin 2\theta$$

Because of root the difference in sign convention arises from the point of view of locating the planes on which shear stress act. From physical point of view these sign have no meaning.

The largest stress regard less of sign is always know as maximum shear stress.

Principal plane inclination in terms of associated principal stress:

We know that the equation

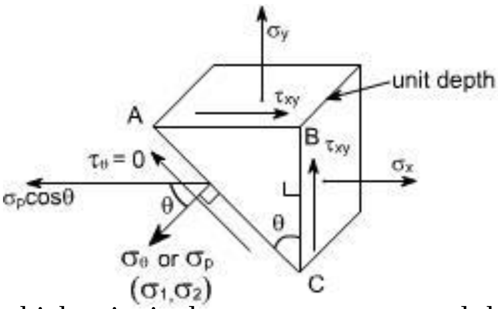
$$\tan 2\theta_p = \frac{2\tau_{xy}}{(\sigma_x - \sigma_y)}$$

yields two values of q i.e. the inclination of the two principal planes on which the principal stresses s_1 and s_2 act. It is uncertain, however, which stress acts on which plane unless equation. is used and observing which one of the

two principal stresses is obtained.

Alternatively we can also find the answer to this problem in the following manner

Consider once again the equilibrium of a triangular block of material of unit depth, Assuming



AC to be a principal plane on which principal stresses < $_p$ acts, and the shear stress is zero.

Resolving the forces horizontally we get:

< $_x$ .BC . 1 + < $_{xy}$ .AB . 1 = < $_p$. cos< . AC dividing the above equation through by BC we get

$$\sigma_x . + \tau_{xy}\frac{AB}{BC} = \sigma_p . \cos\theta . \frac{AC}{BC}$$

or

$$\sigma_x + \tau_{xy}\tan\theta = \sigma_p$$

Thus

$$\boxed{\tan\theta = \frac{\sigma_p - \sigma_x}{\tau_{xy}}}$$

GRAPHICAL SOLUTION – MOHR'S STRESS CIRCLE

The transformation equations for plane stress can be represented in a graphical form known as Mohr's circle. This grapical representation is very useful in depending the relationships between normal and shear stresses acting on any inclined plane at a point in a stresses body.

To draw a Mohr's stress circle consider a complex stress system as shown in the figure

The above system represents a complete stress system for any condition of applied load in two dimensions

The Mohr's stress circle is used to find out graphically the direct stress < and sheer stress<< on any plane inclined at < to the plane on which < $_x$ acts.The direction of < here is taken in anticlockwise direction from the BC.

STEPS:

In order to do achieve the desired objective we proceed in the following manner

(i) Label the Block ABCD.

(ii) Set up axes for the direct stress (as abscissa) and shear stress (as ordinate)

(iii) Plot the stresses on two adjacent faces e.g. AB and BC, using the following sign convention.

Direct stresses<< tensile positive; compressive, negative

Shear stresses – tending to turn block clockwise, positive

– tending to turn block counter clockwise, negative

[i.e shearing stresses are +ve when its movement about the centre of the element is clockwise]

This gives two points on the graph which may than be labeled as respectively to denote stresses on these planes.

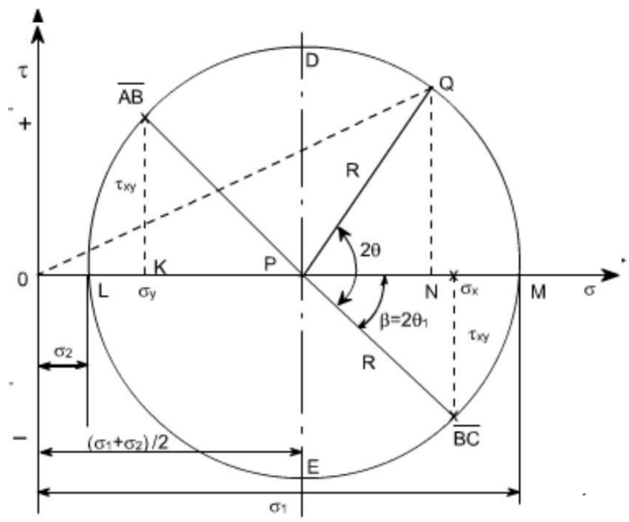
(iv) Join $\overline{AB}$ and $\overline{BC}$.

(v) The point P where this line cuts the s axis is than the centre of Mohr's

stress circle and the line joining $\overline{AB}$ and $\overline{BC}$ is diameter. Therefore the circle can now be drawn.

Now every point on the circle then represents a state of stress on some plane through C.

Proof:



Consider any point Q on the circumference of the circle, such that PQ makes an angle 2<< with BC, and drop a perpendicular from Q to meet the s axis at N.Then OQ represents the resultant stress on the plane an angle < to BC. Here we have assumed that $<_x$ < $<_y$

Now let us find out the coordinates of point Q. These are ON and QN.

From the figure drawn earlier

ON = OP + PN

OP = OK + KP

If we examine the equation (1) and (2), we see that this is the same equation which we have already derived analytically

Thus the co-ordinates of Q are the normal and shear stresses on the plane inclined at < to BC in the original stress system.

N.B: Since angle PQ $\overline{BC}$ is 2< on Mohr's circle and not < it becomes obvious that angles are doubled on Mohr's circle. This is the only difference, however, as They are measured in the same direction and from the same plane in both figures.

Further points to be noted are

(1) The direct stress is maximum when Q is at M and at this point obviously the sheer stress is zero, hence by definition OM is the length representing the maximum principal stresses $<_1$ and 2$<_1$ gives the angle of the plane $<_1$ from BC. Similar OL is the other principal stress and is represented by

$<_2$

(2) The maximum shear stress is given by the highest point on the circle and is represented by the radius of the circle.

This follows that since shear stresses and complimentary sheer stresses have the same value; therefore the centre of the circle will always lie on the s axis midway between $<_x$ and $<_y$. [since +$<_{xy}$ & <$<_{xy}$ are shear stress & complimentary shear stress so they are same in magnitude but different in sign.]

(3) From the above point the maximum sheer stress i.e. the Radius of the Mohr's stress circle

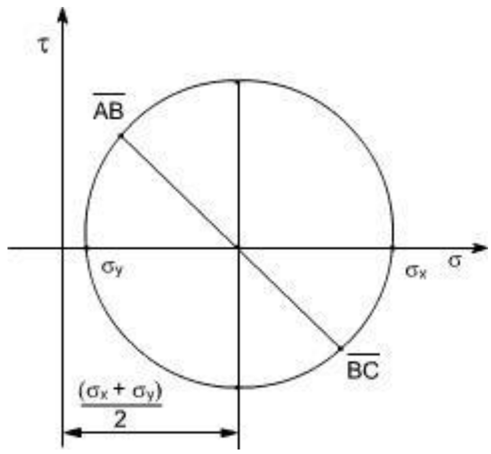
would be

$$\frac{(\sigma_x - \sigma_y)}{2}$$

While the direct stress on the plane of maximum shear must be mid – may between $<_x$ and $<_y$

i.e

$$\frac{(\sigma_x + \sigma_y)}{2}$$



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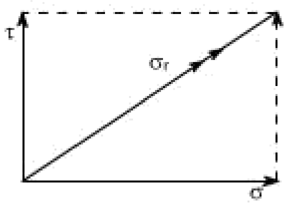


(4) As already defined the principal planes are the planes on which the shear components are
zero.

Therefore are conclude that on principal plane the sheer stress is zero.

(5)

(6) Since the resultant of two stress at 90^0 can be found from the parallogram of vectors as shown in the diagram.Thus, the resultant stress on the plane at q to BC is given by OQ on Mohr's Circle.

(6) The graphical method of solution for a complex stress problems using Mohr's circle is a very powerful technique, since all the information relating to any plane within the stressed element is contained in the single construction. It thus, provides a convenient and rapid means of solution. Which is less prone to arithmetical errors and is highly recommended.

Numericals:

Let us discuss few representative problems dealing with complex state of stress to be solved either analytically or graphically.

Q2:

For a given loading conditions the state of stress in the wall of a cylinder is expressed as follows:

(a) 85 MN/m^2 tensile

(b) 25 MN/m^2 tensile at right angles to (a)

(c) Shear stresses of 60 MN/m^2 on the planes on which the stresses (a) and

(b) act; the sheer couple acting on planes carrying the 25 MN/m^2 stress is clockwise in effect.

Calculate the principal stresses and the planes on which they act. What would be the effect on these results if owing to a change of loading (a) becomes compressive while stresses (b) and (c) remain unchanged

Solution:

The problem may be attempted both analytically as well as graphically. Let us first obtain the analytical solution

σ_1 and σ_2

$$= \frac{1}{2}(\sigma_x + \sigma_y) \pm \frac{1}{2}\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

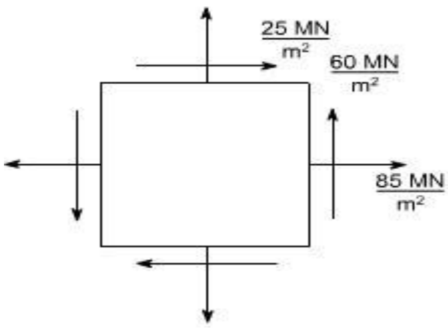
$$= \frac{1}{2}(85 + 25) \pm \frac{1}{2}\sqrt{(85 + 25)^2 + (4 \times 60^2)}$$

$$= 55 \pm \frac{1}{2}.60\sqrt{5} = 55 \pm 67$$

$$\Rightarrow \sigma_1 = 122\ \mathrm{MN/m^2}$$

$$\sigma_2 = -12\ \mathrm{MN/m^2}\,(\text{compressive})$$

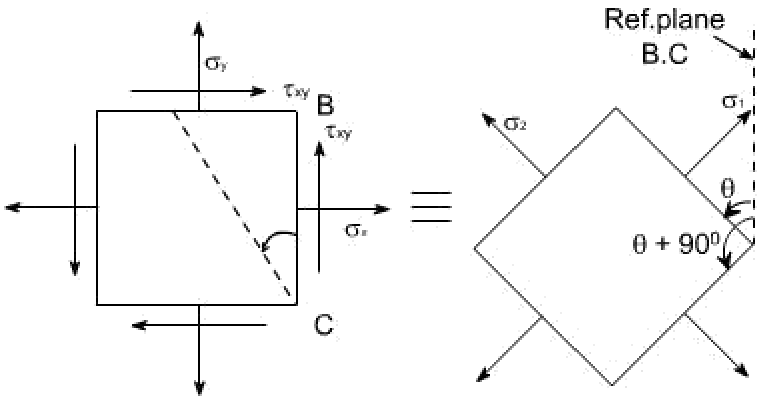
$$\tan 2\theta = \left(\frac{2\tau_{xy}}{\sigma_x - \sigma_y}\right)$$



The principle stresses are given by the formula

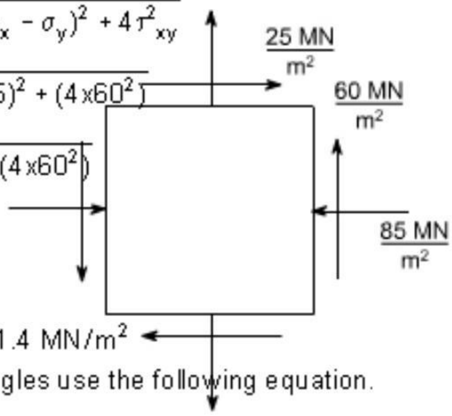
For finding out the planes on which the principle stresses act us the equation

The solution of this equation will yeild two values < i.e they < 1 and < 2 giving < 1= 31071' & < 2= 121071'



(b) In this case only the loading (a) is changed i.e. its direction had been changed. While the other stresses remains unchanged hence now the block diagram becomes.

Again the principal stresses would be given by the equation.



$$\sigma_1 \,\&\, \sigma_2 = \frac{1}{2}(\sigma_x + \sigma_y) \pm \frac{1}{2}\sqrt{(\sigma_x - \sigma_y)^2 + 4\tau^2_{xy}}$$

$$= \frac{1}{2}(-85 + 25) \pm \frac{1}{2}\sqrt{(-85 - 25)^2 + (4 \times 60^2)}$$

$$= \frac{1}{2}(-60) \pm \frac{1}{2}\sqrt{(-85 - 25)^2 + (4 \times 60^2)}$$

$$= -30 \pm \frac{1}{2}\sqrt{12100 + 14400}$$

$$= -30 \pm 81.4$$

$$\sigma_1 = 51.4\ \mathrm{MN/m^2};\ \sigma_2 = -111.4\ \mathrm{MN/m^2}$$

Again for finding out the angles use the following equation.

$$\tan 2\theta = \left(\frac{2\tau_{xy}}{\sigma_x - \sigma_y}\right)$$

$$= \frac{2 \times 60}{-85 - 25} = +\frac{120}{-110}$$

$$= -\frac{12}{11}$$

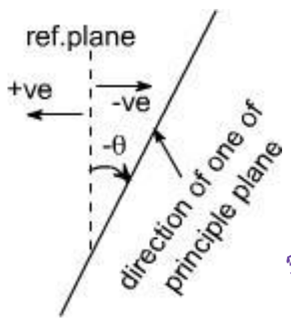
$$2\theta = \tan\left(-\frac{12}{11}\right)$$

$$\Rightarrow \theta = -23.74^0$$

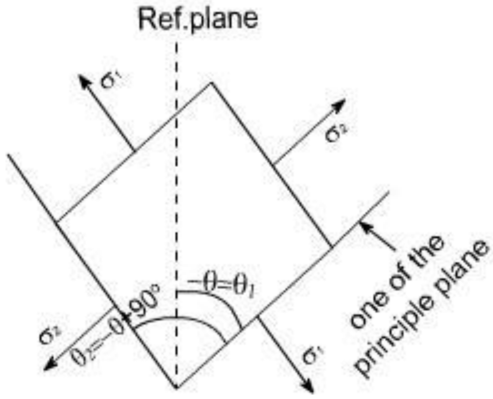
Thus, the two principle stresses acting on the two mutually perpendicular planes i.e principle planes may be depicted on the element as shown below:

So this is the direction of one principle plane & the principle stresses acting on this would be < $_1$ when is acting normal to this plane, now the direction of other principal plane would be 90^0 + < because the principal planes are the two mutually perpendicular plane, hence rotate the another plane
< + 90^0 in the same direction to get the another plane, now complete the material element if < is negative that means we are measuring the angles in the opposite direction to the reference plane BC .

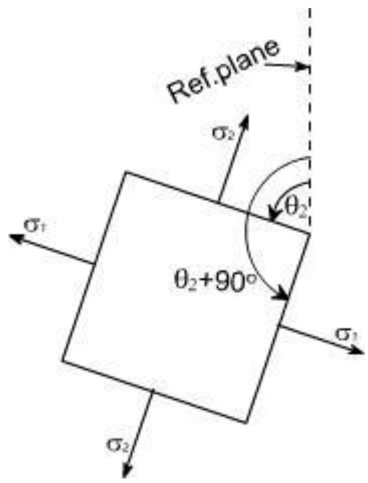
Therefore the direction of other principal planes would be {<< + 90} since the angle << is always less in magnitude then 90 hence the quantity (<<< + 90) would be positive therefore the Inclination of other plane with reference plane would be positive therefore if just complete the Block.



It would appear as



If we just want to measure the angles from the reference plane, than rotate this block through 180^0 so as to have the following appearance.



So whenever one of the angles comes negative to get the positive value, first Add 90^0 to the value and again add 90^0 as in this case $< = < 23^0 74'$

so $<_1 = < 23^0 74' + 90^0 = 66^0 26'$ .Again adding 90^0 also gives the direction of other principle planes

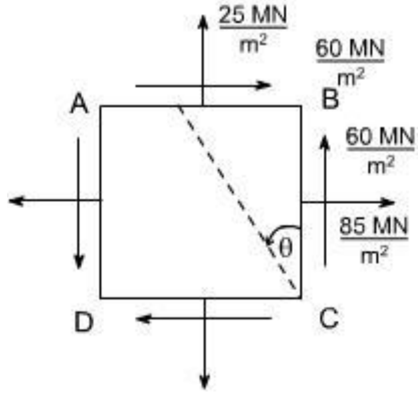
i.e $<_2 = 66^0 26' + 90^0 = 156^0 26'$

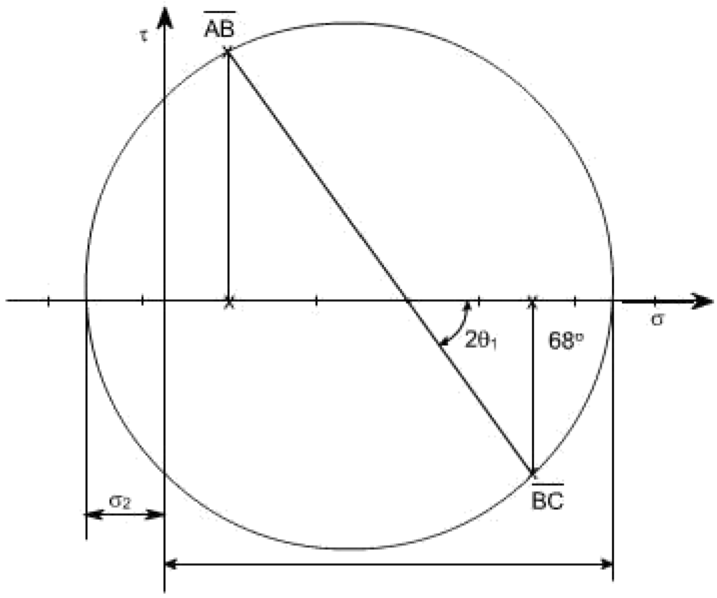
This is how we can show the angular position of these planes clearly.

GRAPHICAL SOLUTION:

Mohr's Circle solution: The same solution can be obtained using the graphical solution i.e the Mohr's stress circle,for the first part, the block diagram bec

Construct the graphical construction as per the steps given earlier.





Taking the measurements from the Mohr's stress circle, the various quantities computed are

$<_1 = 120$ MN/m^2 tensile

$<_2 = 10$ MN/m^2 compressive

$<_1 = 34^0$ counter clockwise from BC

$<_2 = 34^0 + 90 = 124^0$ counter clockwise from BC

Part Second : The required configuration i.e the block diagram for this case is shown along with the stress circle. By taking the measurements, the various quantites computed are given as

$<_1 = 56.5$ MN/m^2 tensile

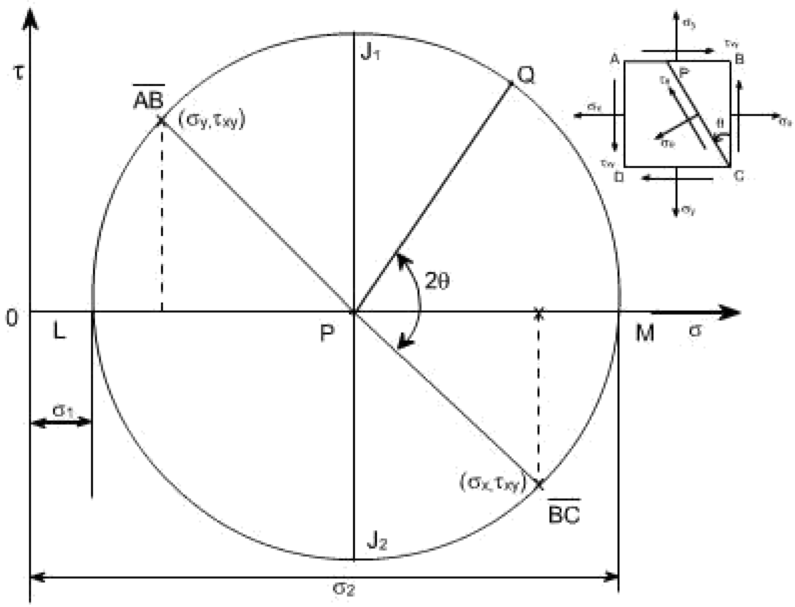
$<_2 = 106$ MN/m^2 compressive

$<_1 = 66^0 15'$ counter clockwise from BC

$<_2 = 156^0 15'$ counter clockwise from BC

Salient points of Mohr's stress circle:

1. complementary shear stresses (on planes 90^0 apart on the circle) are equal in magnitude
2. The principal planes are orthogonal: points L and M are 180^0 apart on the circle (90^0 apart in material)
3. There are no shear stresses on principal planes: point L and M lie on normal stress axis.
4. The planes of maximum shear are 45^0 from the principal points D and E are 90^0 , measured round the circle from points L and M.
5. The maximum shear stresses are equal in magnitude and given by points D and E
6. The normal stresses on the planes of maximum shear stress are equal i.e. points D and E both have
   normal stress co-ordinate which is equal to the two principal stresses.



know that the circle represents all possible states of normal and shear stress on any plane through a stresses point in a material. Further we have seen that the co-ordinates of the point ‘Q' are seen to be the same as those derived from equilibrium of the element. i.e. the normal and shear stress components on any plane passing through the point can be found using Mohr's circle. Worthy of note:

1. The sides AB and BC of the element ABCD, which are 90^0 apart, are represented

   on the circle by $\overline{AB}$ P and $\overline{BC}$ P and they are 180^0 apart.

2. It has been shown that Mohr's circle represents all possible states at a point. Thus, it can be seen at a point. Thus, it, can be seen that two planes LP and PM, 180^0 apart on the diagram and therefore 90^0 apart in the material, on which shear stress < < is zero. These planes are termed as principal planes and normal stresses acting on them are known as principal stresses.
   Thus , $<_1$ = OL

   $<_2$ = OM

3. The maximum shear stress in an element is given by the top and bottom points of the circle i.e by points J_1 and J_2 ,Thus the maximum shear stress would be equal to the radius of i.e. $<_{max}$= 1/2(<< $_1$ <<< $_2$),the corresponding normal stress is obviously the

distance OP = 1/2 (<< $_x$+ < $_y$) , Further it can also be seen that the planes on which the shear stress is maximum are situated 90^0 from the principal planes (on circle), and 45^0 in the material.

4. The minimum normal stress is just as important as the maximum. The algebraic minimum stress could have a magnitude greater than that of the maximum principal stress if the state of stress

were such that the centre of the circle is to the left of

orgin. i.e. if < $_1$ = 20 MN/m^2 (say)

< $_2$ = < 80 MN/m^2 (say)

Then < $_{max}{}^m$ = (< $_1$ < < < $_2$ / 2) = 50 MN/m^2

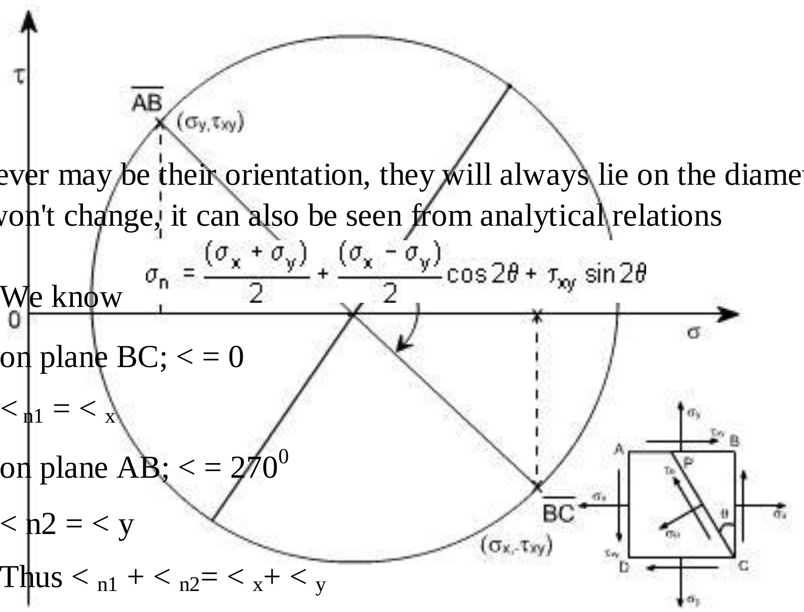
If should be noted that the principal stresses are considered a maximum or minimum mathematically e.g. a compressive or negative stress is less than a positive stress, irrespective or numerical value.

5. Since the stresses on perpendular faces of any element are given by the co- ordinates of two

diametrically opposite points on the circle, thus, the sum of the two normal stresses for any and all orientations of the element is constant, i.e. Thus sum is an invariant for any particular state of stress.

Sum of the two normal stress components acting on mutually perpendicular planes at a point in a state of plane stress is not affected by the orientation of these planes.

This can be also understand from the circle Since AB and BC are diametrically opposite thus,



what ever may be their orientation, they will always lie on the diametre or we can say that their sum won't change, it can also be seen from analytical relations

We know

on plane BC; < = 0

< $_{n1}$ = < $_x$

on plane AB; < = 270^0

< n2 = < y

Thus < $_{n1}$ + < $_{n2}$= < $_x$+ < $_y$

6. If < $_1$ = < $_2$, the Mohr's stress circle degenerates into a point and no shearing stresses are developed on xy plane.

7. If < $_x$+ < $_y$= 0, then the center of Mohr's circle coincides with the origin of < < < < <

co-ordinates.

SUMMARY

Principal Plane: - It is a plane where shear force is zero is called principal plane.

Principal Stress: - The normal stress on the principal plane is called principal stress. **Obliquity**: - It is angle between the resultant stress and normal stress.

Mohr's circle: - It is a graphical (circle) method to find the stresses and strains on a plane.

Principal Plane and Stresses can be solved by

1. Analytical Method – Solving horizontal and vertical stresses to find the normal stress and shear stress using trigonometry method.
2. Graphical Method – Mohr's circle method

Analytical Method:

The equation is solved assuming **ζx** and **ζy** as tensile stresses as positive and **η xy** shear stress clockwise as positive to major principal stress. Simply change the sign if stresses are opposite.

Graphical Method - Drawing Rules of Mohr's Circle:

1. Fix the origin (0,0) that is (x,y) at convenient place in the graph.
2. X – axis to locate axial stress for both x and y directions.
3. Y – axis to locate shear stress for clockwise and anti clockwise shear.
4. Tensile stress is positive along x axis right of origin.
5. Compressive stress is negative along x axis left of origin.
6. Clockwise Shear stress is positive along y axis upward of origin.
7. Anti clockwise shear stress is negative along y axis downward of origin..
8. When there is no shear force ($\eta xy = 0$) draw Mohr's circle from axial stresses. The centre of the Mohr's circle bisects axial stresses (ζx,0) and (ζy,0).
9. When there is shear force draw Mohr's circle from axial stresses and shear stress. The centre of the Mohr's circle bisects the line between (ζx, ηxy) and (ζy, ηxy).
10. Angle of inclination is to be drawn from point (ζy, ηxy) at centre of Mohr's to angle 2θ in clockwise direction.
11. Normal stress, and maximum and minimum principal stresses are taken from the origin along the x-axis of the Mohr's circle.
12. Maximum shear stress is the radius of the Mohr's circle, and shear stresses are taken along the y-axis of the Mohr's circle.
13. The angle between the resultant stress and normal stress in angle of oblique.

UNIT 2

Shear Force and Bending Moment

Any sign convention can be followed but it should be uniform throughout the problem. We have chosen upward load or shear force as positive and downward load or shear force as negative. Similarly take clockwise moment as negative and anticlockwise moment as positive.

Cantilever Beam:

1. Simply add the load from right to find the shear force at various points. Upward SF minus downward SF will give SF at a point it may be +ve or –ve SF.
2. Multiply the load with distance to find the moment at various points. Anti clockwise BM minus clockwise BM will BM at a point it may be +ve or –ve SF.
3. Shear force maximum at the support.
4. Moment maximum at the support and zero at free end.

Simply supported Beam:

1. Find the reactions at the supports.
2. When taking moment to find the reactions consider even the pure moment in the beam, be careful with the direction of the moment. Then follow the SF and BM diagram procedure to complete the figure.
3. Simply add the load from right to find the shear force at various points. Upward SF minus downward SF will give SF at a point it may be +ve or –ve SF.
4. Multiply the load with distance to find the moment at various points. Anti clockwise BM minus clockwise BM will BM at a point it may be +ve or –ve SF.
5. Moment is maximum where SF is zero for pure load only.
6. To find the maximum moment, find section where SF is zero equate upward load to downward load to distance x from a support. Take that distance to find the maximum moment.
7. Moments are zero at the supports.

Over hanging Beam:

1. Find the reactions at the supports.
2. When taking moment to find the reactions consider even the pure moment in the beam, be careful with the direction of the moment. Then follow the SF and BM diagram procedure to complete the figure.
3. Simply add the load from right to find the shear force at various points. Upward SF minus downward SF will give SF at a point it may be +ve or –ve SF.
4. Multiply the load with distance to find the moment at various points. Anti clockwise BM minus clockwise BM will BM at a point it may be +ve or –ve SF.

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5. The moment changes the sign from positive to negative such point is known as point of contraflexure. To find the point of contraflexure find the section where MB is zero equate clockwise moments to anti clockwise moment to distance x from a support.

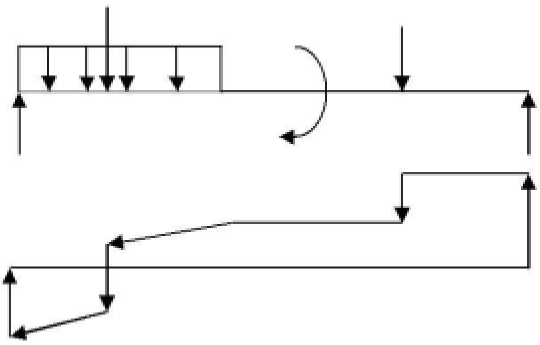
6. Moments are zero at the supports where there is no overhanging, and at the over hanging end.

Drawing Shear force diagram:

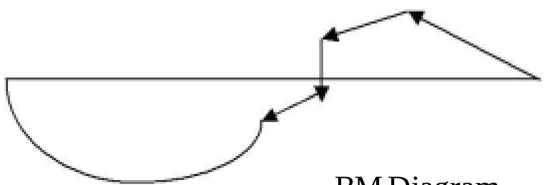
1. Draw a reference line equal to length of the beam to scale.
2. Move the line up if SF is pointing upward or move the line down if SF is pointing downward.
3. When there is no load between loads draw horizontal line parallel to reference line.
4. Point load is represented by vertical line.
5. udl is represented by inclined line.
6. Uniformly varying load is represented by parabola line.
7. Ignore moment for shear force diagram.

Drawing Bending Moment diagram:

1. Draw a reference line equal to length of the beam to scale.
2. Locate a point to find BM, clockwise is taken as negative and anti clockwise is taken as positive.
3. Draw an inclined line to the point if the moment is due to point load only between sections.
4. Draw a parabolic line to the point if the moment is due to udl load between sections.
5. Draw a vertical line for pure moment on the beam, downward if it is clockwise moment and upward if it is anti clockwise moment.



SF Diagram



BM Diagram

ending Stress

M = WL/4 Simply support bean point load at mid span

M = wL ^{2}
M = WL Cantilever beam load at distance L from the support
2

M = wL /2 Cantilever beam of udl throughout the span

Stress is zero at centroid (NA) that is at distance y from the xx-axis and maximum at the top and bottom

We know,

$$\frac{M}{I} = \frac{\zeta}{y} = \frac{E}{R}$$

M – Bending moment or Moment may vary depending on the load example **I** – Moment of Inertia**.**

ζ – Stress due to bending moment. To find **ζc**then **y = yc**and to find **ζt**then **y = yt y** - Centroid of the section about xx axis (NA)**.** To find **ζc**then **y = yc**and to find **ζt** then **y = yt** **E** – Modulus of Elasticity or Young's modulus**.**
R- Radius of curvature due to bending**.**

For symmetric section value of $\zeta c = \zeta t$ because $yc = yt$ example, rectangle, circular, and symmetric I section. That is N.A will be at mid point.The value $yc = y$ from the bottom to NA for beam under compression and $yt = y$ from the top to NA for beam under tension. To find the safe Load or moment find the value of **ζc/yc** and **ζt/yt**and take the least value for safe design.

$I = bd^3/12$
$I = \pi(Do - Di)/64$ for hollow pipe and solid rod $y = Do/2$ for solid pipe $Di = 0$

Centroid (NA) of total section y = sum of (area of each section x centroid of each section from xx axis) divided by sum of (area of each section) Ref: figure

$$y = \frac{a1y1 + a2y2 + \ldots\ anyn}{a1 + a2 + \ldots\ an}$$

Substitute the value y in the moment of inertia equation.

Stress is caused due to Shear force or load. The shear load is right angle to the section. Shear Stress is zero at the top and bottom of the section and it is the maximum at centroid (NA) distance y from the xx-axis.

$$\eta = \frac{FAy}{Ib}$$

η - Shear stress at a point F – Shear load A – Area of the section considered.

y – Centroid distance of the section considered from the Neutral axis of the whole section. I – Inertia of the whole section b – Width of the section considered.

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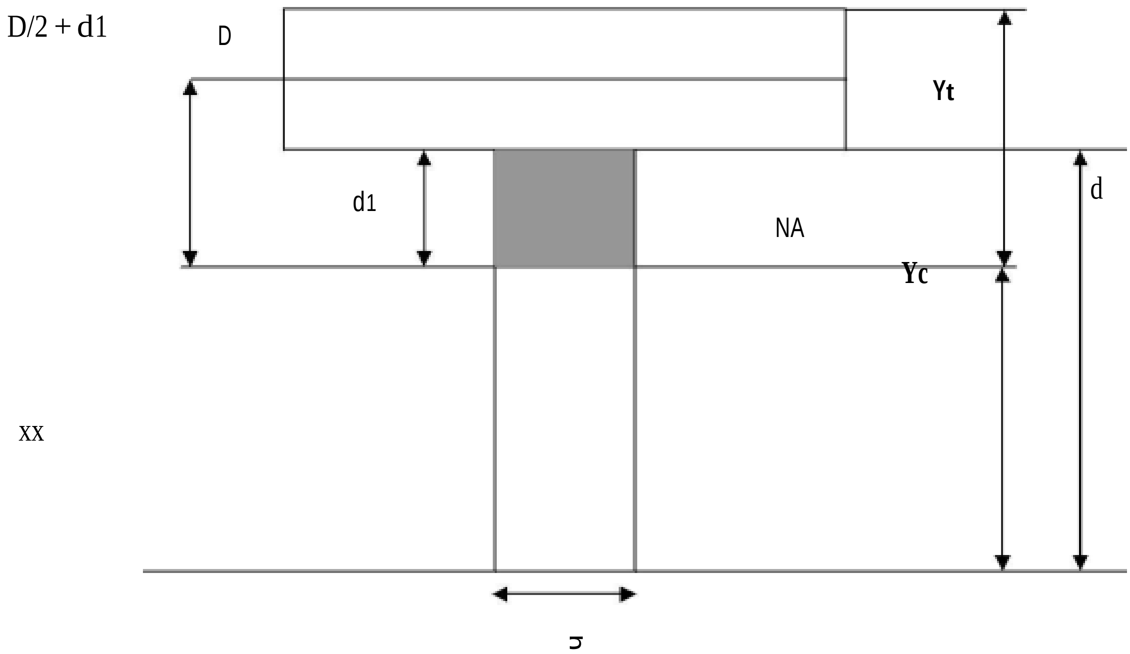

Concept of Shear Force and Bending moment in beams:

When the beam is loaded in some arbitrarily manner, the internal forces and moments are developed and the terms shear force and bending moments come into pictures which are helpful to analyze the beams further. Let us define these terms

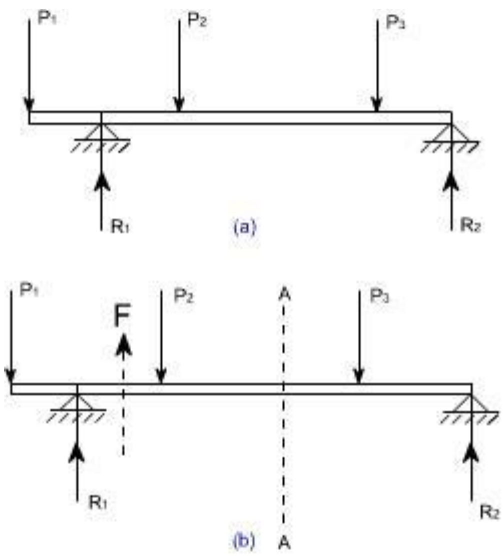

Fig 1

Now let us consider the beam as shown in fig 1(a) which is supporting the loads P_1, P_2, P_3 and is simply supported at two points creating the reactions R_1 and R_2 respectively. Now let us assume that the beam is to divided into or imagined to be cut into two portions at a section AA. Now let us assume that the resultant of loads and reactions to the left of AA is 'F'

vertically upwards, and since the entire beam is to remain in equilibrium, thus the resultant of forces to the right of AA must also be F, acting downwards. This forces 'F' is as a shear force. The shearing force at any x- section of a beam represents the tendency for the portion of the beam to one side of the section to slide or shear laterally relative to the other portion.
Therefore, now we are in a position to define the shear force 'F' to as follows:

At any x-section of a beam, the shear force 'F' is the algebraic sum of all the lateral components of the forces acting on either side of the x-section.

Sign Convention for Shear Force:

The usual sign conventions to be followed for the shear forces have been illustrated in figures 2 and 3.

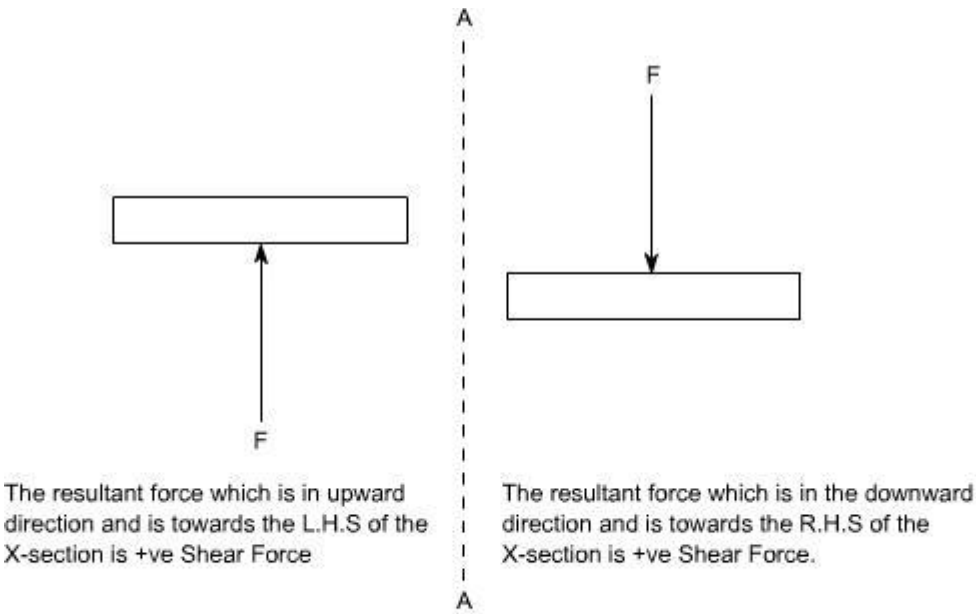

Fig 2: Positive Shear Force

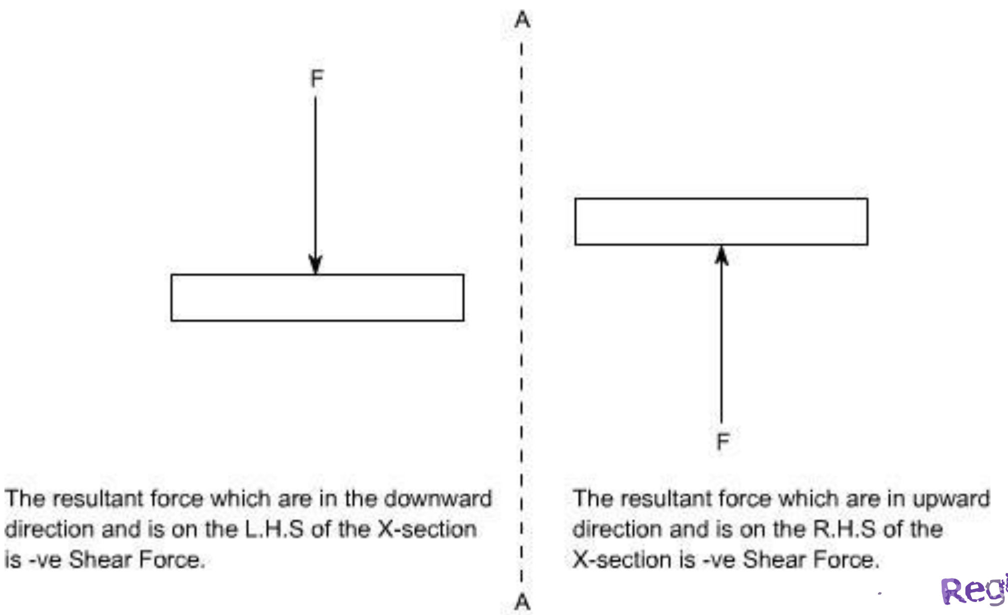

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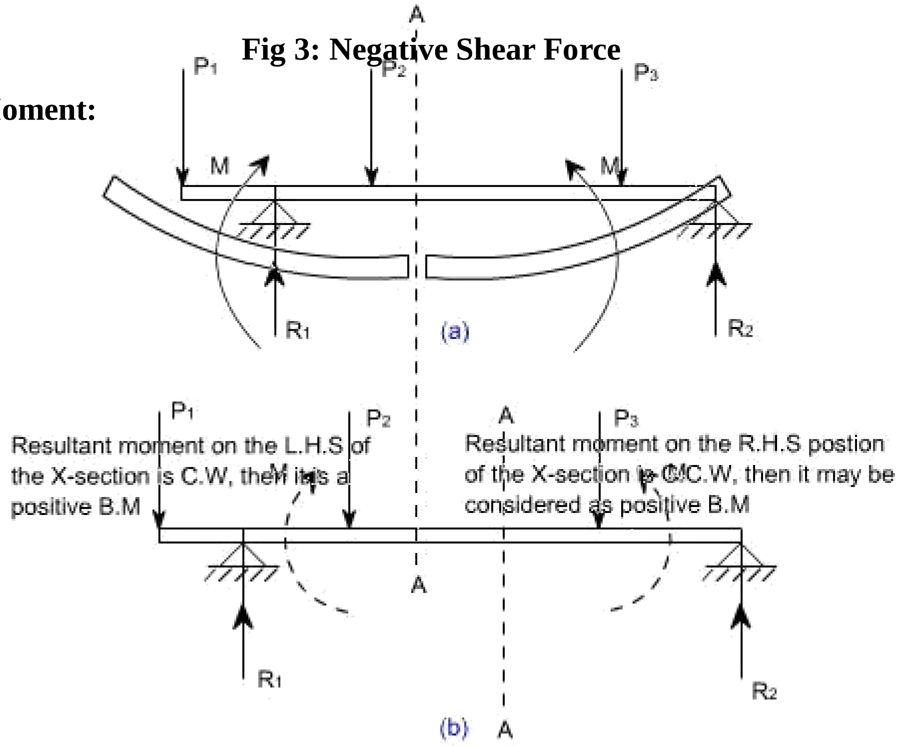
Fig 3: Negative Shear Force

Bending Moment:

Fig 4



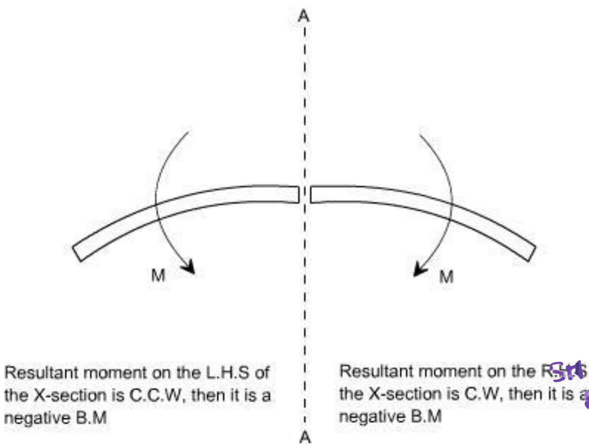
Let us again consider the beam which is simply supported at the two prints, carrying loads P_1, P_2 and P_3 and having the reactions R_1 and R_2 at the supports Fig 4. Now, let us imagine that the beam is cut into two potions at the x-section AA. In a similar manner, as done for the case of shear force, if we say that the resultant moment about the section AA of all the loads and reactions to the left of the x-section at AA is M in C.W direction, then moment of forces to the right of x-section AA must be 'M' in

C.C.W. Then 'M' is called as the Bending moment and is abbreviated as B.M. Now one can define the bending moment to be simply as the algebraic sum of the moments about an x-section of all the forces acting on either side of the section

Sign Conventions for the Bending Moment:

For the bending moment, following sign conventions may be adopted as indicated in Fig 5 and Fig 6.

Fig 5: Positive Bending Moment



Some times, the terms 'Sagging' and Hogging are generally used for the positive and negative bending moments respectively.

Bending Moment and Shear Force Diagrams:

The diagrams which illustrate the variations in B.M and S.F values along the length of the beam for any fixed loading conditions would be helpful to analyze the beam further.

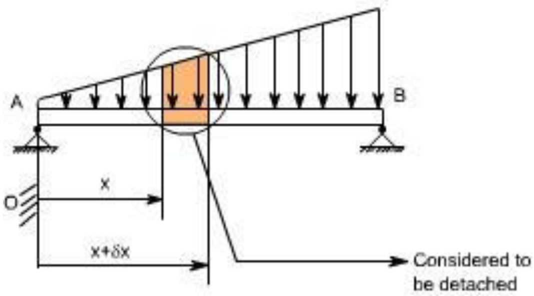
Thus, a shear force diagram is a graphical plot, which depicts how the internal shear force 'F' varies along the length of beam. If x dentotes the length of the beam, then F is function x i.e. F(x).

Similarly a bending moment diagram is a graphical plot which depicts how the internal bending moment 'M' varies along the length of the beam. Again M is a function x i.e. M(x).

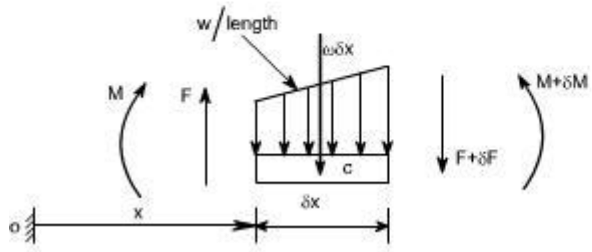
Basic Relationship Between The Rate of Loading, Shear Force and Bending Moment:

The construction of the shear force diagram and bending moment diagrams is greatly simplified if the relationship among load, shear force and bending moment is established.

Let us consider a simply supported beam AB carrying a uniformly distributed load w/length. Let us imagine to cut a short slice of length dx cut out from this loaded beam at distance 'x' from the origin '0'.



Let us detach this portion of the beam and draw its free body diagram.



The forces acting on the free body diagram of the detached portion of this loaded beam are the following

- The shearing force F and F+ δF at the section x and x + δx respectively.
- The bending moment at the sections x and x + δx be M and M + dM respectively.

• Force due to external loading, if ‘w' is the mean rate of loading per unit length then the total loading on this slice of length δx is w. δx, which is approximately acting through the centre ‘c'. If the loading is assumed to be uniformly distributed then it would pass exactly through the centre ‘c'.

This small element must be in equilibrium under the action of these forces and couples. Now let us take the moments at the point ‘c'. Such that

$$M + F.\frac{\delta x}{2} + (F + \delta F).\frac{\delta x}{2} = M + \delta M$$

$$\Rightarrow F.\frac{\delta x}{2} + (F + \delta F).\frac{\delta x}{2} = \delta M$$

$$\Rightarrow F.\frac{\delta x}{2} + F.\frac{\delta x}{2} + \delta F.\frac{\delta x}{2} = \delta M \text{ [Neglecting the product of } \delta F \text{ and } \delta x \text{ being small quantities]}$$

$$\Rightarrow F.\delta x = \delta M$$

$$\Rightarrow F = \frac{\delta M}{\delta x}$$

Under the limits $\delta x \rightarrow 0$

$$\boxed{F = \frac{dM}{dx}} \qquad \ldots\ldots\ldots\ldots \qquad (1)$$

Resolving the forces vertically we get

$$w.\delta x + (F + \delta F) = F$$

$$\Rightarrow w = -\frac{\delta F}{\delta x}$$

Under the limits $\delta x \rightarrow 0$

$$\Rightarrow w = -\frac{dF}{dx} \text{ or } -\frac{d}{dx}\left(\frac{dM}{dx}\right)$$

$$\boxed{w = -\frac{dF}{dx} = -\frac{d^2M}{dx^2}} \qquad \ldots\ldots\ldots\ldots (2)$$

Conclusions: From the above relations,the following important conclusions may be drawn

• From Equation (1), the area of the shear force diagram between any two points, from the basic calculus is the bending moment diagram

$$M = \int F.dx$$

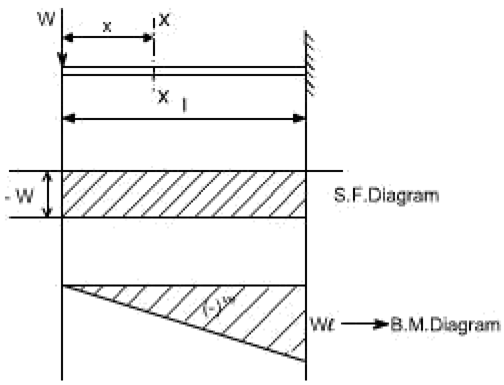
• The slope of bending moment diagram is the shear force, thus

$$F = \frac{dM}{dx}$$

Thus, if F=0; the slope of the bending moment diagram is zero and the bending moment is therefore constant.'

• The maximum or minimum Bending moment occurs where $\frac{dM}{dx} = 0$

The slope of the shear force diagram is equal to the magnitude of the intensity of the distributed loading at any position along the beam. The –ve sign is as a consequence of our particular choice of sign conventions



It may also be observed that a constant shear force produces a uniform change in the bending moment, resulting in straight line in the moment diagram. If no shear force exists along a certain portion of a beam, then it indicates that there is no change in moment takes place. It may also further observe that dm/dx= F therefore, from the fundamental theorem of calculus the maximum or minimum moment occurs where the shear is zero. In order to check the validity of the bending moment diagram, the terminal conditions for the moment must be satisfied. If the end is free or pinned, the computed sum must be equal to zero. If the end is built in, the moment computed by the summation must be equal to the one calculated initially for the reaction. These conditions must always be satisfied.

Illustrative problems:

In the following sections some illustrative problems have been discussed so as to illustrate the procedure for drawing the shear force and bending moment diagrams

1. A cantilever of length carries a concentrated load 'W' at its free end.

Draw shear force and bending moment.

Solution:

At a section a distance x from free end consider the forces to the left, then F = -W (for all values of x) -ve sign means the shear force to the left of the x-section are in downward direction and therefore negative

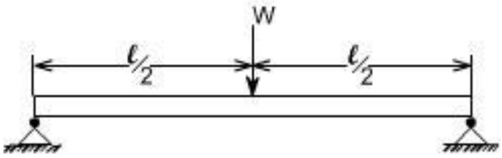
Taking moments about the section gives (obviously to the left of the section)

M = -Wx (-ve sign means that the moment on the left hand side of the portion is in the anticlockwise direction and is therefore taken as –ve according to the sign convention)

so that the maximum bending moment occurs at the fixed end i.e. M = -W l

From equilibrium consideration, the fixing moment applied at the fixed end is Wl and the reaction is W. the shear force and bending moment are shown as,

2. Simply supported beam subjected to a central load (i.e. load acting at the mid- way)



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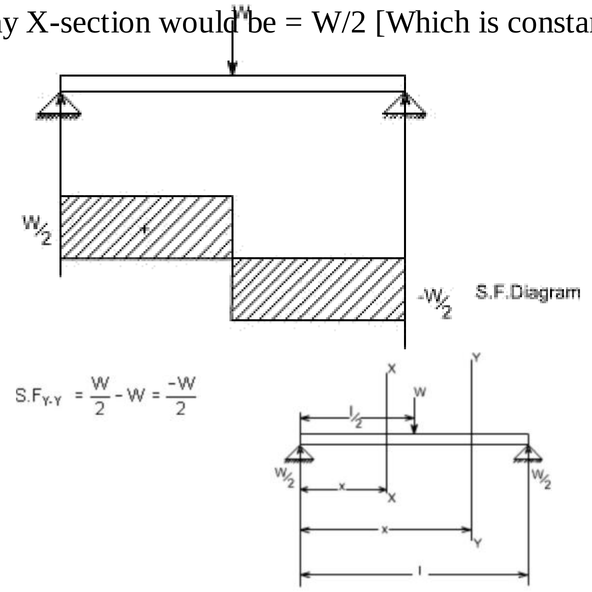
By symmetry the reactions at the two supports would be W/2 and W/2. now consider any section X-X from the left end then, the beam is under the action of following forces.

.So the shear force at any X-section would be = W/2 [Which is constant upto x < l/2]



$$S.F_{Y-Y} = \frac{W}{2} - W = \frac{-W}{2}$$

If we consider another section Y-Y which is beyond l/2 then

for all values greater = l/2

Hence S.F diagram can be plotted as,

.For B.M diagram:

If we just take the moments to the left of the cross-section,

$$B.M_{X-X} = \frac{W}{2}\,x \text{ for } x \text{ lies between } 0 \text{ and } l/2$$

$$B.M_{at\ x = \frac{l}{2}} = \frac{W}{2}\,\frac{l}{2} \text{ i.e B.M at } x = 0$$

$$= \frac{Wl}{4}$$

$$B.M_{Y-Y} = \frac{W}{2}\,x - W\left(x - \frac{l}{2}\right)$$

Again

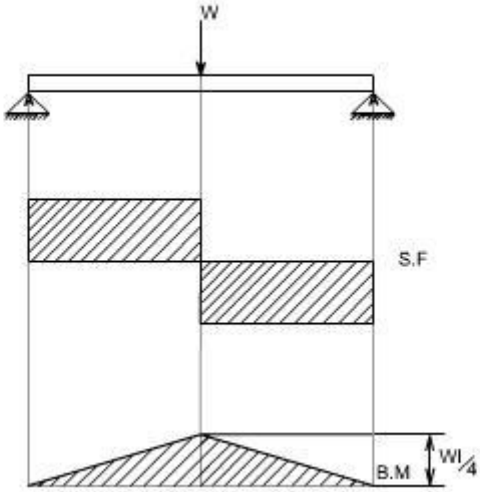
$$= \frac{W}{2}\,x - Wx + \frac{Wl}{2}$$

$$= -\frac{W}{2}\,x + \frac{Wl}{2}$$

$$B.M_{at\ x = l} = -\frac{Wl}{2} + \frac{Wl}{2}$$

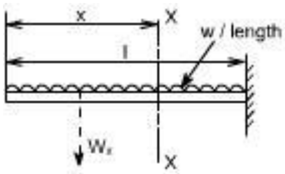
$$= 0$$

Which when plotted will give a straight relation i.e.



It may be observed that at the point of application of load there is an abrupt change in the shear force, at this point the B.M is maximum.

3. A cantilever beam subjected to U.d.L, draw S.F and B.M diagram.



Here the cantilever beam is subjected to a uniformly distributed load whose intensity is given w / length.

Consider any cross-section XX which is at a distance of x from the free end. If we just take the resultant of all the forces on the left of the X-section, then

$S.F_{xx}$ = -Wx for all values of--------------------
'x' **(1)**

$S.F_{xx}$ = 0

S.Fxx at x=1 = -Wl

So if we just plot the equation No. (1), then it will give a straight line relation. Bending Moment at X-X is obtained by treating the load to the left of X-X as a concentrated load of the same value acting through the centre of gravity.

Therefore, the bending moment at any cross-section X-X is

$$B.M_{X-X} = -Wx\frac{x}{2}$$

$$= -W\frac{x^2}{2}$$

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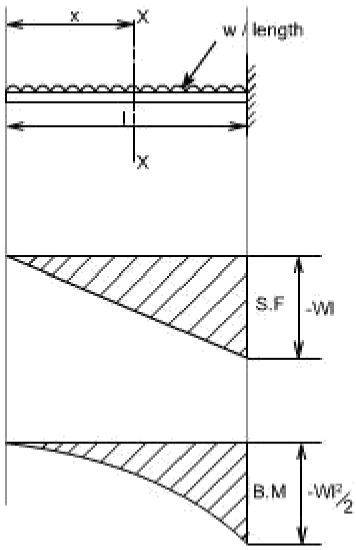


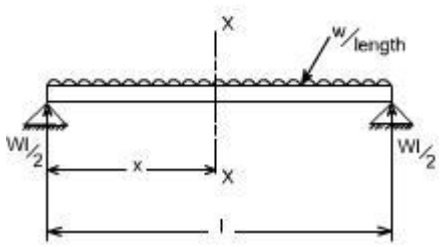
The above equation is a quadratic in x, when B.M is plotted against x this will produces a parabolic variation.
The extreme values of this would be at x = 0 and x = l

$$B.M_{at\ x\ =\ l} = -\frac{Wl^2}{2}$$

$$= \frac{Wl}{2} - Wx$$

Hence S.F and B.M diagram can be plotted as follows:

<u>imply supported beam subjected to a uniformly distributed load [U.D.L].</u>



The total load carried by the span would be

= intensity of loading x length

= w x l

By symmetry the reactions at the end supports are each wl/2

If x is the distance of the section considered from the left hand end of the beam.

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S.F at any X-section X-X is

$$= \frac{Wl}{2} - Wx$$

$$= W\left(\frac{l}{2} - x\right)$$

so at

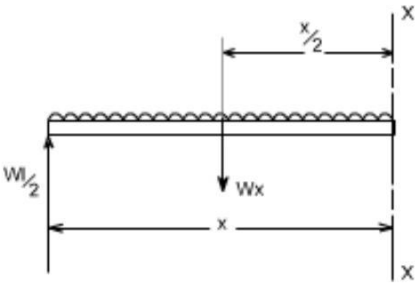
$$S.F_{at\ x=0} = \frac{Wl}{2}$$

$$S.F_{at\ x=\frac{l}{2}} = 0 \text{ hence the S.F is zero at the centre}$$

$$S.F_{at\ x=l} = -\frac{Wl}{2}$$

Giving a straight relation, having a slope equal to the rate of loading or intensity of the loading.

The bending moment at the section x is found by treating the distributed load as acting at its centre of gravity, which at a distance of x/2 from the section



$$B.M_{X\text{-}X} = \frac{Wl}{2}x - Wx.\frac{x}{2}$$

so the

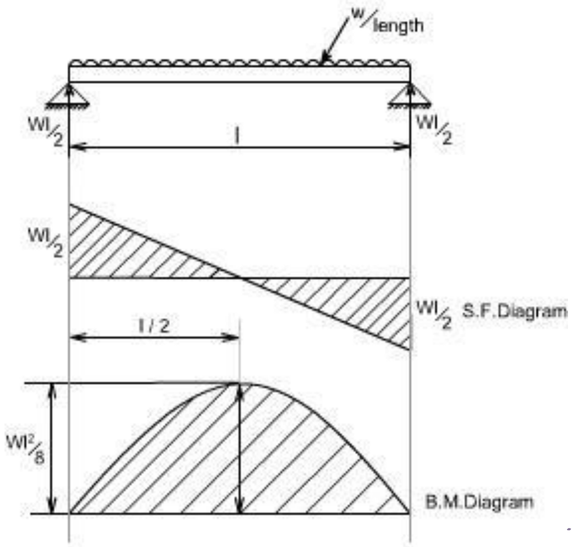
$$= W.\frac{x}{2}(l - 2) \quad ....(2)$$

$$B.M_{at\ x=0} = 0$$

$$B.M_{at\ x=l} = 0$$

$$B.M\Big|_{at\ x=l} = -\frac{Wl^2}{8}$$

So the equation (2) when plotted against x gives rise to a parabolic curve and the shear force and bending moment can be drawn in the following way will appear as follows:



UNIT 3
FLEXURAL AND SHEAR STRESES IN BEAMS

Loading restrictions:

As we are aware of the fact internal reactions developed on any cross-section of a beam may consists of a resultant normal force, a resultant shear force and a resultant couple. In order to ensure that the bending effects alone are investigated, we shall put a constraint on the loading such that the resultant normal and the resultant shear forces are zero on any cross-section perpendicular to the longitudinal axis of the member,

That means F = 0

since $\frac{dM}{dX} = F = 0$ or M = constant.

Thus, the zero shear force means that the bending moment is constant or the bending is same at every cross-section of the beam. Such a situation may be visualized or envisaged when the beam or some portion of the beam, as been loaded only by pure couples at its ends. It must be recalled that the couples are assumed to be loaded in the plane of symmetry.

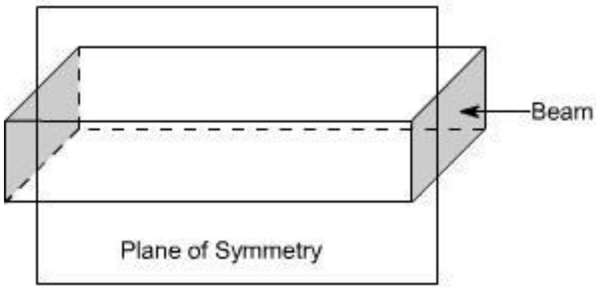


Fig (1)

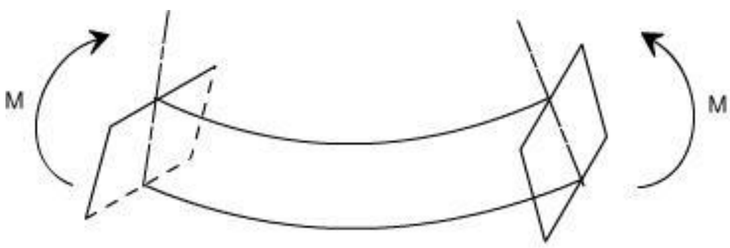
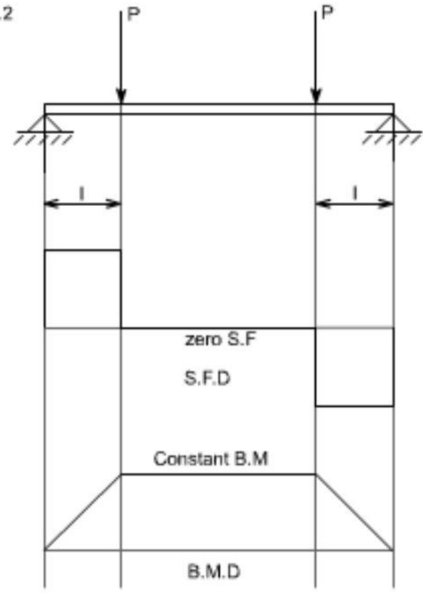
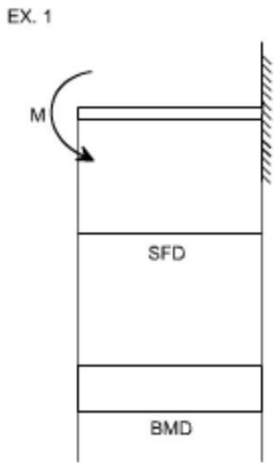


Fig (2)

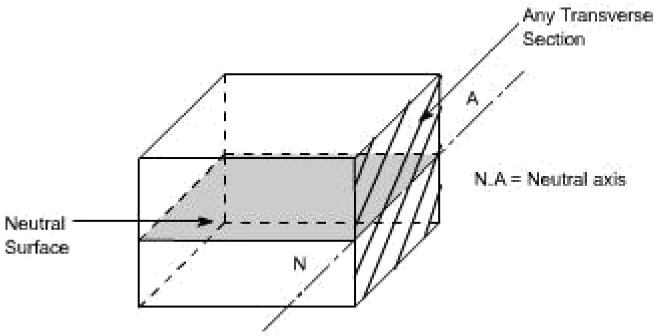
When a member is loaded in such a fashion it is said to be in **pure bending.** The examples of pure bending have been indicated in EX 1and EX 2 as shown below :





When a beam is subjected to pure bending are loaded by the couples at the ends, certain cross-section gets deformed and we shall have to make out the conclusion that,

1. Plane sections originally perpendicular to longitudinal axis of the beam remain plane and perpendicular to the longitudinal axis even after bending , i.e. the cross- section A'E', B'F' (refer Fig 1(a)) do not get warped or curved.
2. In the deformed section, the planes of this cross-section have a common intersection i.e. any time originally parallel to the longitudinal axis of the beam becomes an arc of circle.

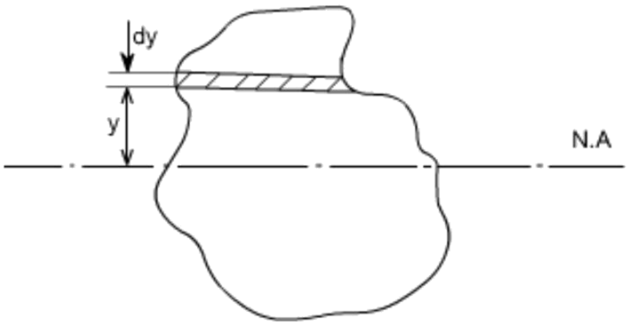


$$= \frac{(R+y)\theta - R\theta}{R\theta} = \frac{R\theta + y\theta - R\theta}{R\theta} = \frac{y}{R}$$

However $\frac{\text{stress}}{\text{strain}} = E$ where E = Young's Modulus of elasticity

Therefore, equating the two strains as obtained from the two relations i.e,

$$\frac{\sigma}{E} = \frac{y}{R} \text{ or } \frac{\sigma}{y} = \frac{E}{R} \qquad \text{.............(1)}$$



We know that when a beam is under bending the fibres at the top will be lengthened while at the bottom will be shortened provided the bending moment M acts at the ends. In between these there are some fibres which remain unchanged in length that is they are not strained, that is they do not carry any stress. The plane containing such fibres is called neutral surface.
The line of intersection between the neutral surface and the transverse exploratory section is called the neutral axisNeutral axis **(N A)** .

Bending Stresses in Beams or Derivation of Elastic Flexural formula :

In order to compute the value of bending stresses developed in a loaded beam, let us consider the two cross-sections of a beam**HE** and **GF** , originally parallel as shown in fig 1(a).when the beam is to bend it is assumed that these sections remain parallel i.e.**H'E'** and **G'F'** , the final position of the sections, are still straight lines, they then subtend some angle < .
Consider now fiber AB in the material, at adistance y from the N.A, when the beam bends this will stretch to A'B'

Therefore,

$$\text{strain in fibre AB} = \frac{\text{change in length}}{\text{orginal length}}$$

$$= \frac{A'B' - AB}{AB}$$

But AB = CD and CD = C'D'

refer to fig1(a) and fig1(b)

$$\therefore \text{strain} = \frac{A'B' - C'D'}{C'D'}$$

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Since CD and C'D' are on the neutral axis and it is assumed that the Stress on the neutral axis zero. Therefore, there won't be any strain on the neutral a

Consider any arbitrary a cross-section of beam, as shown above now the strain on a fibre at a distance ‘y' from the N.A, is given by the expression

$$\sigma = \frac{E}{R} y$$

if the shaded strip is of area 'dA'

then the force on the strip is

$$F = \sigma\, \delta A = \frac{E}{R} y\, \delta A$$

Moment about the neutral axis would be $= F.y = \frac{E}{R}\, y^2 \delta A$

The toatl moment for the whole

cross-section is therefore equal to

$$M = \Sigma \frac{E}{R} y^2\, \delta A = \frac{E}{R} \Sigma y^2 \delta A$$

Now the term $\Sigma y^2 \delta A$ is the property of the material and is called as a second moment of area of the

cross-section and is denoted by a symbol I.

Therefore

$$M = \frac{E}{R} I \qquad \text{.........(2)}$$

combining equation 1 and 2 we get

$$\boxed{\frac{\sigma}{y} = \frac{M}{T} = \frac{E}{R}}$$

This equation is known as the Bending Theory Equation. The above proof has involved the assumption of pure bending without any shear force being present.

Therefore this termed as the pure bending equation. This equation gives distribution of stresses which are normal to cross-section i.e. in x-direction.

Section Modulus:

From simple bending theory equation, the maximum stress obtained in any cross- section is given as For any given allowable stress the maximum moment which can be accepted by a particular shape of

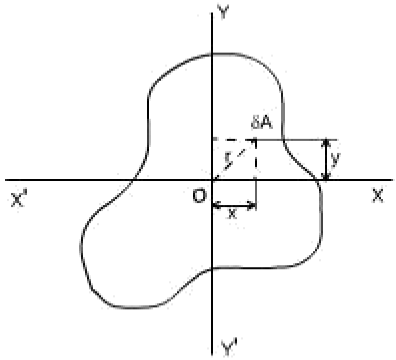
$$\sigma_{max}{}^{m} = \frac{M}{T} y_{max}{}^{m}$$

cross-section is therefore

$$M = \frac{I}{y_{max}{}^{m}}\, \sigma_{max}{}^{m}$$

For ready comparison of the strength of various beam cross-section this relationship is some times written in the form

$$M = Z\sigma_{max}^{m} \text{ where } Z = \frac{I}{y_{max}^{m}}$$



Is termed as section modulu

The higher value of Z for a particular cross-section, the higher the bending moment which it can withstand for a given maximum stress.

Theorems to determine second moment of area: There are two theorems which are helpful to determine the value of second moment of area, which is required to be used while solving the simple bending theory equation.

Second Moment of Area :

Taking an analogy from the mass moment of inertia, the second moment of area is defined as the summation of areas times the distance squared from a fixed axis. (This property arised while we were driving bending theory equation). This is also known as the moment of inertia. An alternative name given to this is second moment of area, because the first moment being the sum of areas times their distance from a

given axis and the second moment being the square of the distance or

$\int y^2\, dA$.

Consider any cross-section having small element of area d A then by the definitio
Ix(Mass Moment of Inertia about x-axis) = $\int y^2\, dA$ and Iy(Mass Moment of Inertia about y-axis) = $\int x^2\, dA$

Now the moment of inertia about an axis through 'O' and perpendicular to the plane of figure is called the polar moment of inertia. (The polar moment of inertia is also the area moment of inertia). i.e,

J = polar moment of inertia

$$\begin{aligned} &= \int r^2 dA \\ &= \int (x^2 + y^2) dA \\ &= \int x^2 dA + \int y^2 dA \\ &= I_X + I_Y \end{aligned}$$

$$\text{or } J = I_X + I_Y \quad \text{.......... (1)}$$

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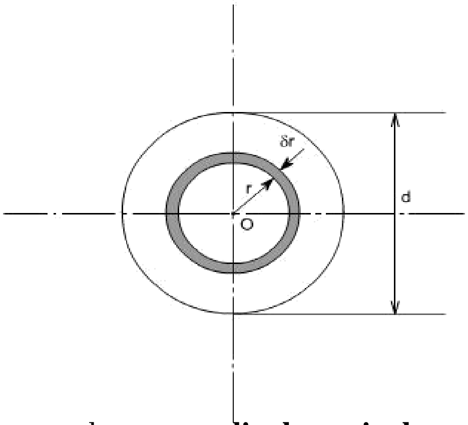

The relation (1) is known as the **perpendicular axis theorem** and may be stated as follows: The sum of the Moment of Inertia about any two axes in the plane is equal to the moment of inertia about an axis perpendicular to the plane, the three axes being concurrent, i.e, the three axes exist together.

CIRCULAR SECTION :

For a circular x-section, the polar moment of inertia may be computed in the following manner

Consider any circular strip of thickness < r located at a radius 'r'. Than the area of the circular strip would be dA = 2< r. < r

$$J = \int r^2 dA$$

Taking the limits of intergration from 0 to d/2

$$J = \int_0^{\frac{d}{2}} r^2 2\pi r \delta r$$

$$= 2\pi \int_0^{\frac{d}{2}} r^3 \delta r$$

$$J = 2\pi \left[\frac{r^4}{4} \right]_0^{\frac{d}{2}} = \frac{\pi d^4}{32}$$

however, by perpendicular axis theorem

$$J = I_x + I_y$$

But for the circular cross-section, the I_x and I_y are both equal being moment of inertia about a diameter

$$I_{dia} = \frac{1}{2} J$$

$$I_{dia} = \frac{\pi d^4}{64}$$

for a hollow circular section of diameter D and d, the values of J and I are defined as

$$J = \frac{\pi (D^4 - d^4)}{32}$$

$$I = \frac{\pi (D^4 - d^4)}{64}$$

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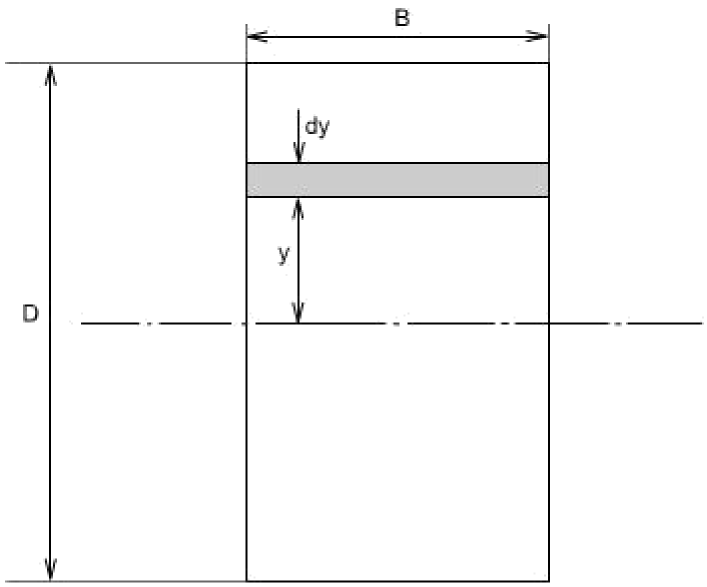
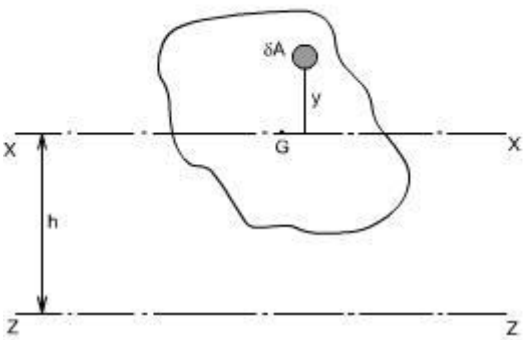
Thus



Parallel Axis Theorem:

The moment of inertia about any axis is equal to the moment of inertia about a parallel axis through the centroid plus the area times the square of the distance between the axes.

If 'ZZ' is any axis in the plane of cross-section and 'XX' is a parallel axis through the centroid G, of



the cross-section, then

$I_z = \int (y+h)^2\ dA$ by definition (moment of inertia about an axis ZZ)

$$= \int \left(+ 2yh + h^2 \right) dA$$

$$= \int y^2 dA + h^2 \int dA + 2h \int y dA$$

Since $\int y dA = 0$

$$= \int y^2 dA + h^2 \int dA$$

$$= \int y^2 dA + h^2 A$$

$I_z = I_x + Ah^2 \qquad I_x = I_G$ (since cross-section axes also pass through G)

Where A = Total area of the section

Rectangular Section:

For a rectangular x-section of the beam, the second moment of area may be computed as below :

Consider the rectangular beam cross-section as shown above and an element of area **dA** , thickness **dy**

, breadth **B** located at a distance **y** from the neutral axis, which by symmetry passes through the centre of section. The second moment of area **I** as defined earlier would be

Thus, for the rectangular section the second moment of area about the neutral axis i.e., an axis through the centre is given by

$$I_{N.A} = \int y^2 \, dA$$

$$I_{N.A} = \int_{\frac{-D}{2}}^{\frac{D}{2}} y^2 (B \, dy)$$

$$= B \int_{\frac{-D}{2}}^{\frac{D}{2}} y^2 \, dy$$

$$I = B\left[\frac{y^3}{3}\right]_0^D = \frac{BD^3}{3}$$

$$\left[\frac{y^3}{3}\right]_{\frac{-D}{2}}^{\frac{D}{2}}$$

$$= \frac{B}{3}\left[\frac{D^3}{8} - \left(\frac{-D^3}{8}\right)\right]$$

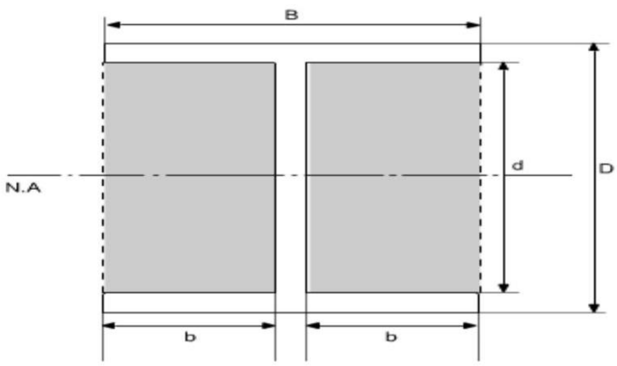
$$= \frac{B}{3}\left[\frac{D^3}{8} + \frac{D^3}{8}\right]$$

$$I_{N.A} = \frac{BD^3}{12}$$

Similarly, the second moment of area of the rectangular section about an axis through the lower edge of the section would be found using the same procedure but with integral limits of **0** to **D** .

Therefore

These standards formuls prove very convenient in the determination of I_{NA} for build up sections which can be conveniently divided into rectangles. For instance if we just want to find out the Moment of Inertia of an I - section, then we can use the above relation.



$$I_{N.A} = I_{\text{of dotted rectangle}} - I_{\text{of shaded portion}}$$

$$\therefore I_{N.A} = \frac{BD^3}{12} - 2\left(\frac{bd^3}{12}\right)$$

$$I_{N.A} = \frac{BD^3}{12} - \frac{bd^3}{6}$$

Use of Flexure Formula:

Illustrative Problems:

An I - section girder, 200mm wide by 300 mm depth flange and web of thickness is 20 mm is used as
simply supported beam for a span of 7 m. The girder carries a distributed load of 5 KN /m and a
concentrated load of 20 KN at mid-span.
Determine the

(i). The second moment of area of the cross-section of the girder

(ii). The maximum stress set up.

Solution:

The second moment of area of the cross-section can be determained as follows :

For sections with symmetry about the neutral axis, use can be made of standard I value for a rectangle about an axis through centroid i.e. (bd 3)/12. The section can thus be divided into convenient rectangles for each of which the neutral axis passes through the centroid. Example in the case enclosing the girder by a rectangle

Computation of Bending Moment:

$$I_{girder} = I_{rectangle} - I_{shaded\ portion}$$

$$= \left[\frac{200 \times 300^3}{12}\right] 10^{-12} - 2\left[\frac{90 \times 260^3}{12}\right] 10^{-12}$$

$$= (4.5 - 2.64)10^{-4}$$

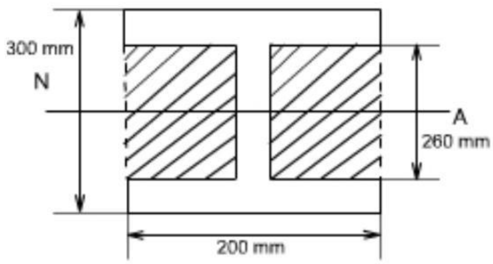
$$= 1.86 \times 10^{-4}\ m^4$$

The maximum stress may be found from the simple bending theory by equation

$$\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$$

i.e.

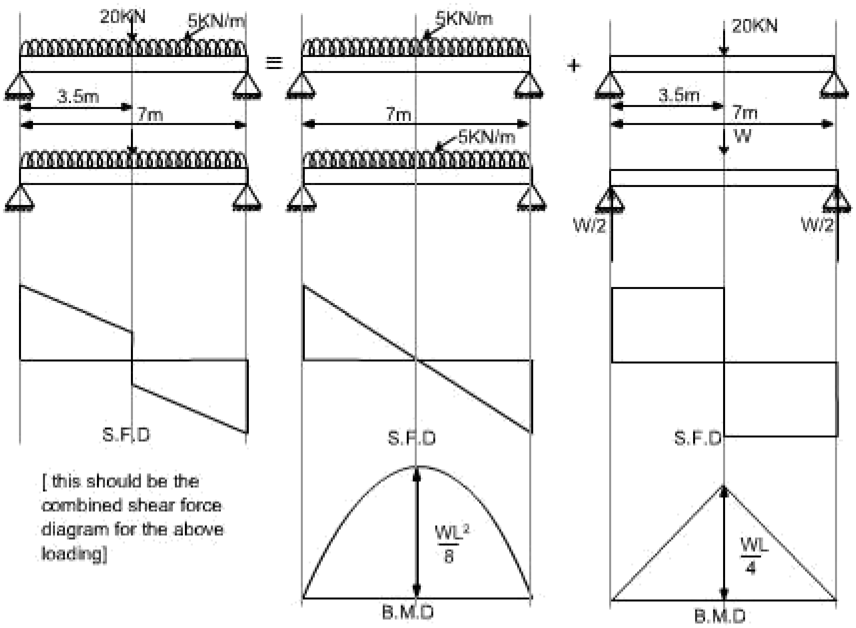
$$\sigma_{max^m} = \frac{M_{max^m}}{I}\ y_{max^m}$$



In this case the loading of the beam is of two types

(a) Uniformly distributed load

(b) Concentrated Load



In order to obtain the maximum bending moment the technique will be to consider each loading on the beam separately and get the bending moment due to it as if no other forces acting on the structure and then superimpose the two results.

Hence

$$M_{max^m} = \frac{wL}{4} + \frac{wL^2}{8}$$

$$= \frac{20 \times 10^3 \times 7}{4} + \frac{5 \times 10^3 \times 7^2}{8}$$

$$= (35.0 + 30.63)10^3$$

$$= 65.63 \text{ kNm}$$

$$\sigma_{max^m} = \frac{M_{max^m}}{I} \, y_{max^m}$$

$$= \frac{65.63 \times 10^3 \times 150 \times 10^3}{1.06 \times 10^{-4}}$$

$$\sigma_{max^m} = 51.8 \text{ MN/m}^2$$

Shearing Stresses in Beams

All the theory which has been discussed earlier, while we discussed the bending stresses in beams was for the

case of pure bending i.e. constant bending moment acts

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UNIT-4

TORSION OF CIRCULAR SHAFTS

Simple or Single shaft

$$\frac{T}{I_p} = \frac{\zeta}{r} = \frac{G\theta}{L}$$ **is general equation to stress and twist due to torsion.**

T = Torque or Torsion or Angular Velocity obtained from power Ip = Polar moment of inertia is sum of Ixxand Iyy ζ = Shear stress in shaft r = radius of shaft

L = Length of shaft θ=Angle of twist in radian. G or C= Modulus of rigidity

Convert to radian 180

P =Hollow shaft

$$I_p = \frac{\Pi(D}{32}$$ Ip = I/2 only for circular section

D - External dia and d – internal dia

Solid shaft d = 0

Therefore, ΠDIp =Strength of shaft

Angle of twist is,

Torsional rigidity is the product of G and Ip which is GIp. Zp is known as polar modulus which is ratio of Polar inertia over the distance from NA.

Conditions: Torque is same in shafts T1= T2

Twist θ= θ1+ θ2Shafts rotate in same direction

Twist θ = θ 1- θ 2Shafts rotate in opposite direction

Choose the least Torque between shafts for safe stress and angle of twist.

Shafts in parallel:

Conditions: Total Torque T = T1+ T2

Twist is same in both shaft θ1= θ2

The shafts may be of same material or different material, which is known as composite shaft.

Strain energy or Torsional resilience in shaft:

It is the amount of energy stored when the shaft is in twisted position.

Torsional energy U = Average Torque x angle of twist

T x θ

When U is divided by the volume of the shaft, is known as strain energy per unit volume.

Shaft coupled:

The shaft is joined together when the length is not sufficient this is known as coupling of shaft. It is done in two methods.

1. Using bolts
2. Using key

Bolt method

T can be obtained from shaft expression for bolt and keyed shaft.

$$T = \frac{\zeta I p}{r} \quad \text{or from Power expression } P = \frac{2\pi NT}{60}$$

T is torque in shaft which is transmitted to the coupled shaft through bolts or key. Therefore torque in bolts or key is equal to torque in shaft.

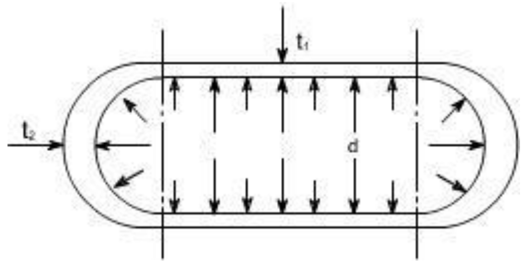
T = no. of bolts **x** area of bolt **x** stress in bolt **x** radius of bolt circle

Therefore T = n x Πdb

Cylindrical Vessel with Hemispherical Ends:

Let us now consider the vessel with hemispherical ends. The wall thickness of the cylindrical and hemispherical portion is different. While the internal diameter of both the portions is assumed to be equal

Let the cylindrical vassal is subjected to an internal pressure p.



For the Cylindrical Portion

hoop or circumferential stress $= \sigma_{HC}$ 'c' here synifies the cylindrical portion.

$$= \frac{pd}{2t_1}$$

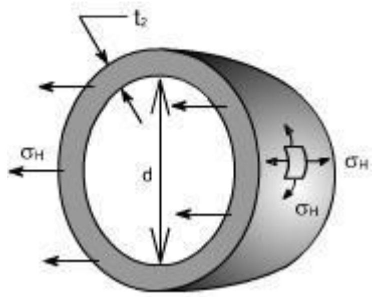
longitudnal stress $= \sigma_{LC}$

$$= \frac{pd}{4t_1}$$

hoop or circumferential strain $\in_2 = \frac{\sigma_{HC}}{E} - \nu\frac{\sigma_{LC}}{E} = \frac{pd}{4t_1E}[2-\nu]$

$$\text{or} \quad \boxed{\in_2 = \frac{pd}{4t_1E}[2-\nu]}$$

For The Hemispherical Ends:



Because of the symmetry of the sphere the stresses set up owing to internal pressure will be two mutually perpendicular hoops or circumferential stresses of equal values. Again the radial stresses are neglected in comparison to the hoop stresses as with this cylinder having thickness to diametre less than1:20.

Consider the equilibrium of the half – sphere

Force on half-sphere owing to internal pressure = pressure x projected Area

= p. < $d^2/4$

Resisting force = $\sigma_H \cdot \pi . d . t_2$

$\therefore \qquad p . \frac{\pi . d^2}{4} = \sigma_H \cdot \pi d . t_2$

$\Rightarrow \quad \sigma_H \text{ (for sphere)} = \frac{pd}{4t_2}$

similarly the hoop strain $= \frac{1}{E}\left[\sigma_H - \nu . \sigma_H\right] = \frac{\sigma_H}{E}[1 - \nu] = \frac{pd}{4t_2 E}[1 - \nu]$ or $\boxed{\epsilon_{2s} = \frac{\mathbf{pd}}{\mathbf{4t_2E}}[\mathbf{1 - \nu}]}$

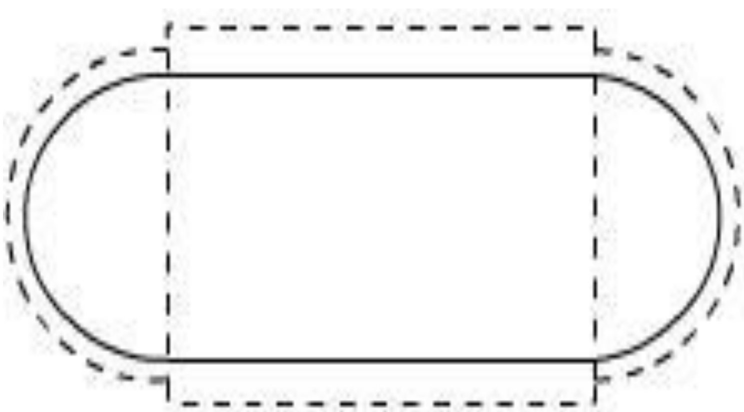


Fig – shown the (by way of dotted lines) the tendency, for the cylindrical portion and the spherical ends to expand by a different amount under the action of internal pressure. So owing to difference in stress, the two portions (i.e. cylindrical and spherical ends) expand by a different amount. This incompatibly of deformations causes a local bending and sheering stresses in the neighborhood of the joint. Since there must be physical continuity between the ends and the cylindrical portion, for this reason, properly curved ends must be used for pressure vessels.

Thus equating the two strains in order that there shall be no distortion of the junction

$$\frac{pd}{4t_1E}[2-\nu]=\frac{pd}{4t_2E}[1-\nu] \quad \text{or} \quad \frac{t_2}{t_1}=\frac{1-\nu}{2-\nu}$$

But for general steel works $\nu = 0.3$, therefore, the thickness ratios becomes

$\mathbf{t_2 / t_1 = 0.7/1.7}$

i.e. the thickness of the cylinder walls must be approximately 2.4 times that of the hemispheroid ends for no distortion of the junction to occur.

SUMMARY OF THE RESULTS : Let us summaries the derived results

(A) The stresses set up in the walls of a thin cylinder owing to an internal pressure p are :

(i) Circumferential or loop stress

$\sigma_H = pd/2t$

(ii) Longitudinal or axial stress

$\sigma_L = pd/4t$

Where d is the internal diametre and t is the wall thickness of the cylinder. then

Longitudinal strain $\epsilon_L = 1/E\,[\sigma_L - \nu\sigma_H]$

Hoop stain $\epsilon_H = 1/E\,[\sigma_H - \nu\sigma_L]$

(B) Change of internal volume of cylinder under pressure

$$= \frac{pd}{4tE}[5 - 4\nu]V$$

(C) Fro thin spheres circumferential or loop stress

$$\sigma_H = \frac{pd}{4t}$$

Thin rotating ring or cylinder

Consider a thin ring or cylinder as shown in Fig below subjected to a radial internal pressure p caused by the centrifugal effect of its own mass when rotating. The centrifugal effect on a unit length of the circumference is

$p = m\,\omega^2\,r$

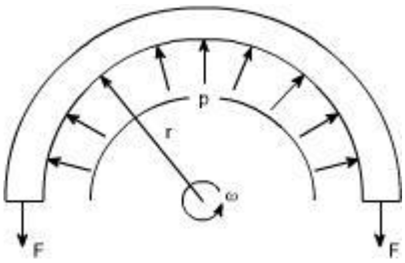


Fig 19.1: Thin ring rotating with constant angular velocity

Here the radial pressure 'p' is acting per unit length and is caused by the centrifugal effect if its own mass when rotating.

Thus considering the equilibrium of half the ring shown in the figure, 2F = p x 2r (assuming unit length), as 2r is the projected area F = pr

Where F is the hoop tension set up owing to rotation.

The cylinder wall is assumed to be so thin that the centrifugal effect can be assumed constant across the wall thickness.

F = mass x acceleration = $\mathbf{m\,\omega^2\,r \times r}$

This tension is transmitted through the complete circumference and therefore is resisted by the complete cross – sectional area.

hoop stress = F/A = $\mathbf{m\,\omega^2\,r^2 / A}$

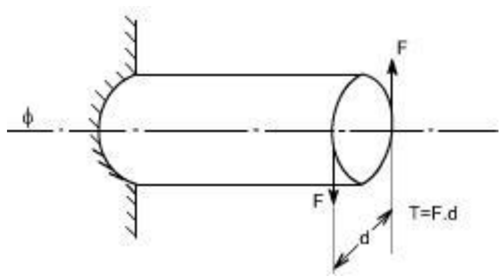
Where A is the cross – sectional area of the ring.

Now with unit length assumed m/A is the mass of the material per unit volume, i.e. the density < .

hoop stress $\sigma_H = \rho\,\omega^2\ \mathbf{r}^2$

Torsion of circular shafts

Definition of Torsion: Consider a shaft rigidly clamped at one end and twisted at the other end by a torque T = F.d applied in a plane perpendicular to the axis of the bar such a shaft is said to be in torsion.



Effects of Torsion: The effects of a torsional load applied to a bar are

(i) To impart an angular displacement of one end cross – section with respect to the other end.

(ii) To setup shear stresses on any cross section of the bar perpendicular to its axis.

Assumption:

(i) The materiel is homogenous i.e of uniform elastic properties exists throughout the material.

(ii) The material is elastic, follows Hook's law, with shear stress proportional to shear strain.

(iii) The stress does not exceed the elastic limit.

(iv) The circular section remains circular

(v) Cross section remain plane.

(vi) Cross section rotate as if rigid i.e. every diameter rotates through the same angle.

Consider now the solid circular shaft of radius R subjected to a torque T at one end, the other end being fixed Under the action of this torque a radial line at the free end of the shaft twists through an of distortion of the shaft i.e the shear strain.

Since angle in radius = arc /

Radius arc AB = R

From the definition of Modulus of rigidity or Modulus of elasticity in shear

$$G = \frac{\text{shear stress}(\tau)}{\text{shear strain}(\gamma)}$$

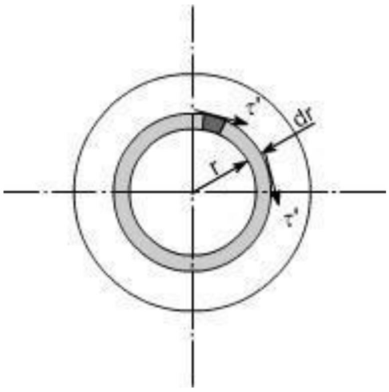
where γ is the shear stress set up at radius R.

Then $\frac{\tau}{G} = \gamma$

Equating the equations (1) and (2) we get $\frac{R\theta}{L} = \frac{\tau}{G}$

$\frac{\tau}{R} = \frac{G\theta}{L}\left(= \frac{\tau'}{r}\right)$ where τ' is the shear stress at any radius r.

Stresses: Let us consider a small strip of radius r and thickness dr which is subjected to shear stress τ'.



The force set up on each element = stress x area

$$\text{i.e } \tau' = \frac{G\theta . r}{L}$$

$$\text{we get } T = \int_0^R 2\pi \frac{G\theta}{L} . r^3 \, dr$$

$$T = \frac{2\pi G\theta}{L} \int_0^R r^3 \, dr$$

$$= \frac{2\pi G\theta}{L} . \left[\frac{R^4}{4} \right]_0^R$$

$$= \frac{G\theta}{L} . \frac{2\pi R^4}{4}$$

$$= \frac{G\theta}{L} . \frac{\pi R^4}{2}$$

$$= \frac{G\theta}{L} . \left[\frac{\pi d^4}{32} \right] \quad \text{now substituting } R = d/2$$

$$= \frac{G\theta}{L} . J$$

$$\text{since } \frac{\pi d^4}{32} = J \text{ the polar moment of inertia}$$

$$\text{or } \frac{T}{J} = \frac{G\theta}{L} \qquad \text{......(2)}$$

if we combine the equation no.(1) and (2) we get $\boxed{\frac{T}{J} = \frac{\tau'}{r} = \frac{G.\theta}{L}}$

The total torque T on the section, will be the sum of all the contributions.

Since τ' is a function of r, because it varies with radius so writing down τ' in terms of r from the equation (1).

Where

T = applied external Torque, which is constant over Length L;

J = Polar moment of Inertia

$$= \frac{\pi d^4}{32} \text{ for solid shaft}$$

$$= \frac{\pi (D^4 - d^4)}{32} \text{ for a hollow shaft.}$$

[D = Outside diameter ; d = inside

diameter] G = Modules of rigidity (or Modulus of elasticity in shear)

θ = It is the angle of twist in radians on a length L.

Tensional Stiffness: The tensional stiffness k is defined as the torque per radius twist i.e, k = T / θ = GJ / L

TORSION OF HOLLOW SHAFTS:

From the torsion of solid shafts of circular x – section , it is seen that only the material at the outer surface of the shaft can be stressed to the limit assigned as an

allowable working stresses. All of the material within the shaft will work at a lower stress and is not being used to full capacity. Thus, in these cases where the weight reduction is important, it is advantageous to use hollow shafts. In discussing the torsion of hollow shafts the same assumptions will be made as in the case of a solid shaft. The general torsion equation as we have applied in the case of torsion of solid shaft will hold good

Hence by examining the equation (1) and (2) it may be seen that the $_{max}{}^{m}$ in the case of hollow shaft is 6.6% larger than in the case of a solid shaft having the same outside diameter.

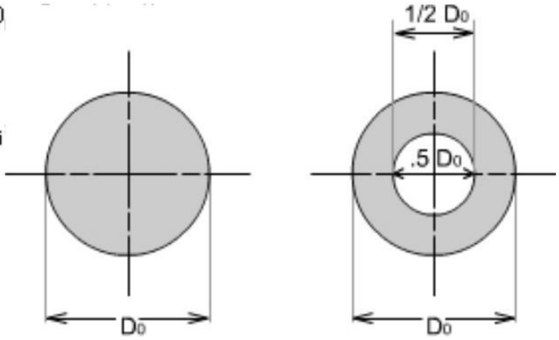
Reduction in weight:

$$\frac{T}{J} = \frac{\tau}{r} = \frac{G.\theta}{l}$$

For the hollow shaft

$$J = \frac{\pi(D_0{}^4 - d_i{}^4)}{32} \quad \text{where D}$$

Let d_i



$$\tau_{max^m}\Big|_{solid} = \frac{16T}{\pi D_0{}^3}$$

$$\tau_{max^m}\Big|_{hollow} = \frac{T.D_0/2}{\frac{\pi}{32}(D_0{}^4 - d_i{}^4)}$$

$$= \frac{16T.D_0}{\pi D_0{}^4\left[1-(d_i/D_0)^4\right]}$$

$$= \frac{16T}{\pi D_0{}^3\left[1-(1/2)^4\right]} = 1.066.\frac{16T}{\pi D_0{}^3} \qquad (2)$$

Considering a solid and hollow shafts of the same length 'l' and density ' ' with $d_i = 1/2\ D_o$

Weight of hollow shaft

$$= \left[\frac{\pi D_0{}^2}{4} - \frac{\pi(D_0/2)^2}{4}\right] l \times \rho$$

$$= \left[\frac{\pi D_0{}^2}{4} - \frac{\pi D_0{}^2}{16}\right] l \times \rho$$

$$= \frac{\pi D_0{}^2}{4}\left[1 - 1/4\right] l \times \rho$$

$$= 0.75\frac{\pi D_0{}^2}{4} l \times \rho$$

$$\text{Weight of solid shaft} = \frac{\pi D_0{}^2}{4}.l.\rho$$

$$\text{Reduction in weight} = (1-0.75)\frac{\pi D_0{}^2}{4} l \times \rho$$

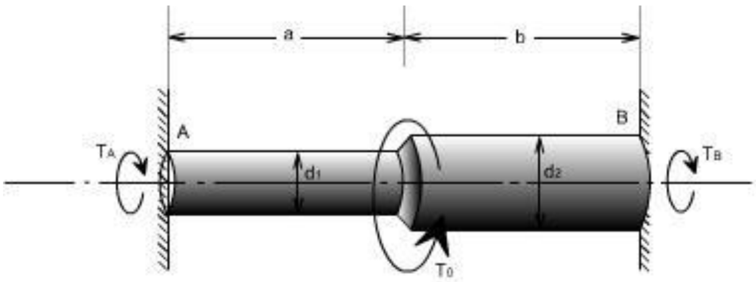
$$= 0.25\frac{\pi D_0{}^2}{4} l \times \rho$$

Hence the reduction in weight would be just 25%.

<u>Illustrative Examples :</u>

<u>Problem 1</u>

A stepped solid circular shaft is built in at its ends and subjected to an externally applied torque. T_0 at the shoulder as shown in the figure. Determine the angle of along the entire of the shoulder section where T_0 is length of the beam.
rotation□$_0$



Closed Coiled helical Spring

<u>Closed Coiled helical springs subjected to axial loads:</u>

Definition: A spring may be defined as an elastic member whose primary function is to deflect or distort under the action of applied load; it recovers its original shape when load is released. or

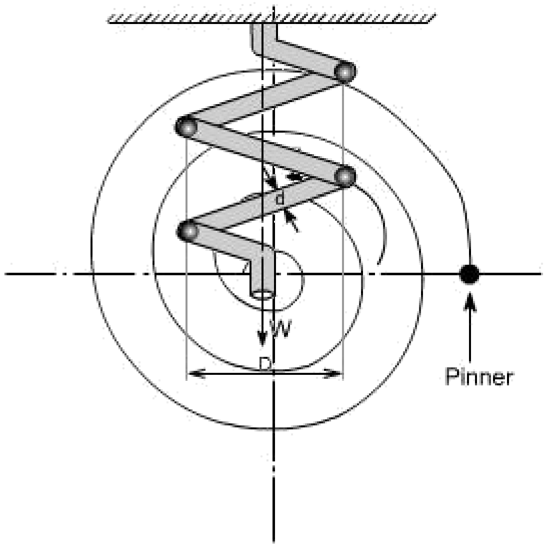
Springs are energy absorbing units whose function is to store energy and to restore it slowly or rapidly depending on the particular application.

Important types of springs are:

There are various types of springs such as

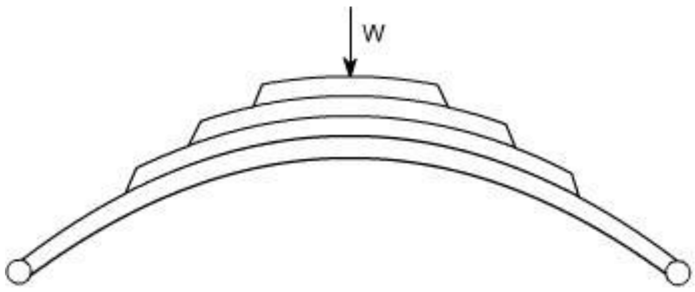
(i) helical spring: They are made of wire coiled into a helical form, the load being applied along the axis of the helix. In these type of springs the major stresses is torsional shear stress due to twisting. They are both used in tension and compression.

(ii) Spiral springs: They are made of flat strip of metal wound in the form of spiral and loaded in torsion.



(iv) Leaf springs: They are composed of flat bars of varying lengths clamped together so as to obtain greater efficiency . Leaf springs may be full elliptic, semi elliptic or cantilever types, In these type of springs the major stresses which come into picture are tensile & compressive.

These type of springs are used in the automobile suspension system.



Uses of springs :

(a) To apply forces and to control motions as in brakes and clutches.

(b) To measure forces as in spring balance.

(c) To store energy as in clock springs.

(d) To reduce the effect of shock or impact loading as in carriage springs.

(e) To change the vibrating characteristics of a member as inflexible mounting of motors.

<u>Derivation of the Formula :</u>

In order to derive a necessary formula which governs the behaviour of springs, consider a closed coiled spring subjected to an axial load W.

Let

W = axial load

D = mean coil diameter

d = diameter of spring wire n =

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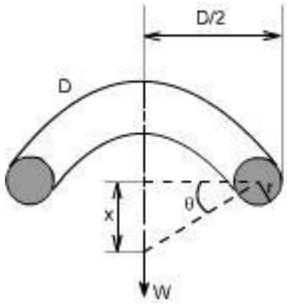
number of active coils
C = spring index = D / d For circular wires l =
length of spring wire
G = modulus of rigidity x
= deflection of spring q =
Angle of twist
when the spring is being subjected to an axial load to the wire of the spring gets be twisted like a shaft.
If q is the total angle of twist along the wire and x is the deflection of spring under the action of load
W along the axis of the coil, so that
x = D / 2 . <

again l = < D n [consider ,one half turn of a close coiled helical spring]



Assumptions: (1) The Bending & shear effects may be neglected

(2) For the purpose of derivation of formula, the helix angle is considered to be so small that it may be neglected.

Any one coil of a such a spring will be assumed to lie in a plane which is nearly < r to the axis of the spring. This requires that adjoining coils be close together. With this limitation, a section taken perpendicular to the axis the spring rod becomes nearly vertical. Hence to maintain equilibrium of a segment of the spring, only a shearing force V = F and Torque T = F. r are required at any X – section. In the analysis of springs it is customary to assume that the shearing stresses caused by the direct shear force is uniformly distributed and is negligible so applying the torsion formula.

Using the torsion formula i.e

$$\frac{T}{J} = \frac{\tau}{r} = \frac{G.\theta}{l}$$

$$\text{and substituting } J = \frac{\pi d^4}{32}; T = w.\frac{d}{2}$$

$$\theta = \frac{2.x}{D}; l = \pi D.x$$

$$K = \frac{4c-1}{4c-4} + \frac{0.615}{c}$$

SPRING DEFLECTION

$$\frac{\frac{w.d/2}{\frac{\pi d^4}{32}}} = \frac{G.2x/D}{\pi D.n}$$

Thus,

$$x = \frac{8w.D^3.n}{G.d^4}$$

Spring striffness: The stiffness is defined as the load per unit deflection therefore

$$k = \frac{w}{x} = \frac{w}{\frac{8w.D^3.n}{G.d^4}}$$

Therefore

$$k = \frac{G.d^4}{8.D^3.n}$$

Shear stress

$$\frac{\frac{w.d/2}{\frac{\pi d^4}{32}}} = \frac{\tau_{max^m}}{d/2}$$

$$\text{or } \tau_{max^m} = \frac{8wD}{\pi d^3}$$

WAHL'S FACTOR :

In order to take into account the effect of direct shear and change in coil curvature a stress factor is defined, which is known as Wahl's factor

K = Wahl' s factor and is defined as Where C = spring index

= D/d

if we take into account the Wahl's factor than the formula for the shear stress

becomes $\tau_{max^m} = \frac{16.T.k}{\pi d^3}$

Strain Energy : The strain energy is defined as the energy which is stored within a material when the work has been done on the material.

$$x = \frac{8wD^3.n}{G.d^4}$$

on substituting the relevant parameters we get

$$50 = \frac{8.5000.(0.0314d^3)^3.8}{83,000.d^4}$$

$$d = 13.32mm$$

In the case of a spring the strain energy would be due to bending and the strain energy due to bending is given by the expansion

$$U = \frac{T^2L}{2EI}$$

$$L = \pi Dn$$

$$I = \frac{\pi d^4}{64}$$

so after substitution we get

$$U = \frac{32T^2Dn}{E.d^4}$$

Example: A close coiled helical spring is to carry a load of 5000N with a deflection of 50 mm and a maximum shearing stress of 400 N/mm^2 .if the number of active turns or active coils is 8.Estimate the following:

(i) wire diameter

(ii) mean coil diameter

(iii) weight of the spring.

Assume G = 83,000 N/mm^2 ; $<$ = 7700 kg/m^3

solution :

(i) for wire diametre if W is the axial load, then

$$\frac{\frac{w.d/2}{\frac{\pi d^4}{32}}}{} = \frac{\tau_{max^m}}{d/2}$$

$$D = \frac{400}{d/2}.\frac{\pi d^4}{32}.\frac{2}{W}$$

$$D = \frac{400.\pi d^3.2}{5000.16}$$

$$D = 0.0314\,d^3$$

Futher, deflection is given as

Therefore,

D = .0314 x (13.317)^{3}mm

=74.15mm D

= 74.15 mm

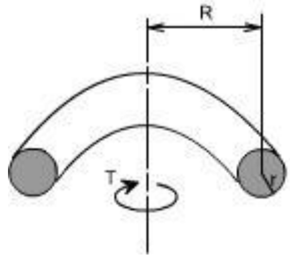
Weight

mass or weight = volume. density
= area.length of the spring.density of spring material

$$= \frac{\pi d^2}{4}.\pi D n.\rho$$

On substituting the relevant parameters we get
Weight = 1.996 kg
= 2.0kg

Close – coiled helical spring subjected to axial torque T or axial couple.



In this case the material of the spring is subjected to pure bending which tends to reduce Radius R of the coils. In this case the bending moment is constant through out the spring and is equal to the applied axial Torque T. The stresses i.e. maximum

$$\sigma_{max} = \frac{M.y}{I} = \frac{T.d/2}{\frac{\pi d^4}{64}}$$

$$\sigma_{max} = \frac{32T}{\pi d^3}$$

bending stress may thus be determined from the bending theory.

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Deflection or wind – up angle:

Under the action of an axial torque the deflection of the spring becomes the "wind – up" angle of the spring which is the angle through which one end turns relative to the

other. This will be equal to the total change of slope along the wire, according to area

– moment theorem

$$\theta = \int_0^L \frac{M\,dL}{EI} \quad \text{but } M = T$$

$$= \int_0^L \frac{T.dL}{EI} = \frac{T}{EI}\int_0^L dL$$

Thus, as 'T' remains constant

$$\theta = \frac{T.L}{EI}$$

Futher

$$L = \pi D.n$$

$$I = \frac{\pi d^4}{64}$$

Therefore, on substitution, the value of θ obtained is

$$\boxed{\theta = \frac{64T.D.n}{E.d^4}}$$

Springs in Series: If two springs of different stiffness are joined endon and carry a common load W, they are said to be connected in series and the combined stiffness and deflection are given by the following equation.

$$\frac{W}{k} = x_1 + x_2 = \frac{W}{k_1} + \frac{W}{k_2}$$

or

$$\boxed{\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2}}$$

Springs in parallel: If the two spring are joined in such a way that they have a common deflection 'x'

; then they are said to be connected in parallel.In this care the load carried is shared between the two springs and total load $W = W_1 + W_2$

$$x = \frac{W}{k} = \frac{W_1}{k_1} = \frac{W_2}{k_2}$$

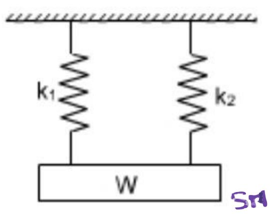
$$\text{Thus } W_1 = \frac{Wk_1}{k}$$

$$W_2 = \frac{Wk_2}{k}$$

Futher

$$W = W_1 + W_2$$

$$\text{thus } \boxed{k = k_1 + k_2}$$



UNIT 5

Columns and Struts

Introduction:
Structural members which carry compressive loads may be divided into two broad categories depending on their relative lengths and cross-sectional dimensions.

Columns:

Short, thick members are generally termed columns and these usually fail by crushing when the yield stress of the material in compression is exceeded.

Struts:

Long, slender columns are generally termed as struts, they fail by buckling some time before the yield stress in compression is reached. The buckling occurs owing to one the following reasons. (a). the strut may not be perfectly straight initially.

(b). the load may not be applied exactly along the axis of the Strut.

(c). one part of the material may yield in compression more readily than others owing to some lack of uniformity in the material properties through out the strut.

In all the problems considered so far we have assumed that the deformation to be both progressive with increasing load and simple in form i.e. we assumed that a member in simple tension or compression becomes progressively longer or shorter but remains straight. Under some circumstances however, our assumptions of progressive and simple deformation may no longer hold good and the member become unstable. The term strut and column are widely used, often interchangeably in the context of buckling of slender members.]

At values of load below the buckling load a strut will be in stable equilibrium where the displacement caused by any lateral disturbance will be totally recovered when the disturbance is removed. At the buckling load the strut is said to be in a state of neutral equilibrium, and theoretically it should than be possible to gently deflect the strut into a simple sine wave provided that the amplitude of wave is kept small.

Theoretically, it is possible for struts to achieve a condition of unstable equilibrium with loads exceeding the buckling load, any slight lateral disturbance then causing failure by buckling, this condition is never achieved in practice under static load conditions. Buckling occurs immediately at the point where the buckling load is reached, owing to the reasons stated earlier.

The resistance of any member to bending is determined by its flexural rigidity EI and is The quantity I may be written as $I = Ak^2$,
Where I = area of moment of inertia A =
area of the cross-section
k = radius of gyration.

The load per unit area which the member can withstand is therefore related to k. There will be two principal moments of inertia, if the least of these is taken then the ratio

Is called the slenderness ratio. It's numerical value indicates whether the member falls into the class

$\frac{l}{k}$ i.e. $\frac{\text{length of member}}{\text{least radius of gyration}}$

of columns or struts.

$E.M_C = -P.y$

Futher,we know that

$$EI\frac{d^2y}{dx^2} = M$$

$$EI\frac{d^2y}{dx^2} = -P.y = M$$

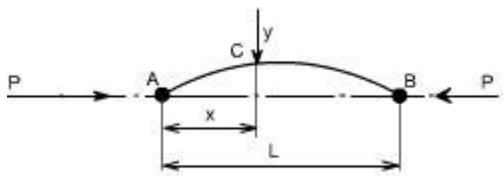
Euler's Theory : The struts which fail by buckling can be analyzed by Euler's theory. In the following sections, different cases of the struts have been analyzed.

Case A: Strut with pinned ends:

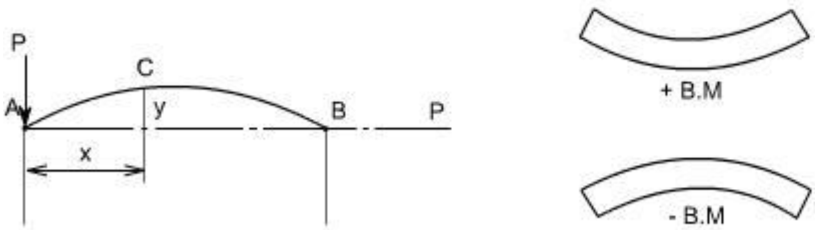
Consider an axially loaded strut, shown below, and is subjected to an axial load 'P' this load 'P' produces a deflection 'y' at a distance 'x' from one end.

Assume that the ends are either pin jointed or rounded so that there is no moment at either end.

Assumption:



The strut is assumed to be initially straight, the end load being applied axially through centroid.



In this equation 'M' is not a function 'x'. Therefore this equation can not be integrated directly as has been done in the case of deflection of beams by integration method.

Thus,

$$EI\frac{d^2y}{dx^2} + Py = 0$$

Though this equation is in 'y' but we can't say at this stage where the deflection would be maximum or minimum.

So the above differential equation can be arranged in the following form $\frac{d^2y}{dx^2} + \frac{Py}{EI} = 0$

Let us define a operator D = d/dx

$(D^2 + n^2)\, y = 0$ where $n^2 = P/EI$

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This is a second order differential equation which has a solution of the form consisting of complimentary function and particular integral but for the time being we are interested in the complementary solution only[in this P.I = 0; since the R.H.S of Diff. equation = 0] Thus y = A cos (nx) + B sin (nx) Where A
and B are some constants.

Therefore $y = A\cos\sqrt{\frac{P}{EI}}\,x + B\sin\sqrt{\frac{P}{EI}}\,x$

In order to evaluate the constants A and B let us apply the boundary conditions,

(i) at x = 0; y = 0

(ii) at x = L ; y = 0

Applying the first boundary condition yields A = 0.
Applying the second boundary condition gives

$$B\sin\left(L\sqrt{\frac{P}{EI}}\right) = 0$$

Thus either B = 0, or $\sin\left(L\sqrt{\frac{P}{EI}}\right) = 0$

if B=0,that y0 for all values of x hence the strut has not buckled yet.Therefore,the solution required is

$$\sin\left(L\sqrt{\frac{P}{EI}}\right) = 0 \text{ or } \left(L\sqrt{\frac{P}{EI}}\right) = \pi \text{ or } nL = \pi$$

$$\text{or } \sqrt{\frac{P}{EI}} = \frac{\pi}{L} \text{ or } P = \frac{\pi^2 EI}{L^2}$$

From the above relationship the least value of P which will cause the strut to buckle, and it is called the " **Euler Crippling Load** " $P_e$from which w obtain.

$$\boxed{P_e = \frac{\pi^2 EI}{L^2}}$$

It may be noted that the value of I used in this expression is the least moment of inertia
It should be noted that the other solutions exists for the equation

$$\sin\left(l\sqrt{\frac{P}{EI}}\right) = 0 \qquad \text{i.e. } \sin nL = 0$$

The interpretation of the above analysis is that for all the values of the load P, other than those which make sin nL = 0; the strut will remain perfectly straight since y = B sin nL = 0

For the particular value of

$$P_e = \frac{\pi^2 EI}{L^2}$$

$$\sin nL = 0 \quad \text{or } nL = \pi$$

$$\text{Therefore } n = \frac{\pi}{L}$$

$$\text{Hence } y = B\sin nx = B\sin\frac{\pi x}{L}$$

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Then we say that the strut is in a state of neutral equilibrium, and theoretically any deflection which it suffers will be maintained. This is subjected to the limitation that 'L' remains sensibly constant and in practice slight increase in load at the critical value will cause the deflection to increase appreciably until the material fails by yielding.

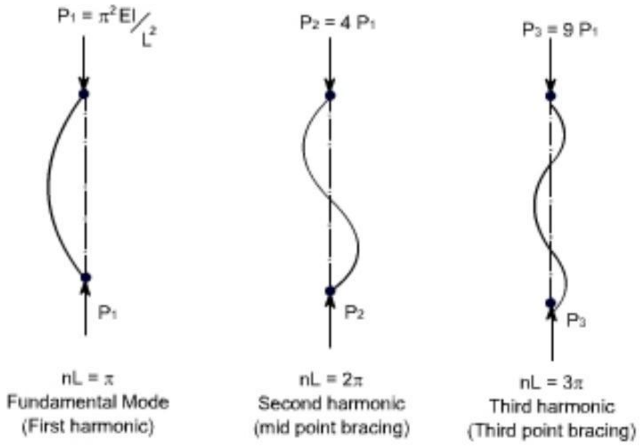
Further it should be noted that the deflection is not proportional to load, and this applies to all strut problems; like wise it will be found that the maximum stress is not proportional to load.

The solution chosen of nL = < is just one particular solution; the solutions nL= 2< , 3< , 5< etc are equally valid mathematically and they do, infact, produce values of

'P_e' which are equally valid for modes of buckling of strut different from that of a simple bow. Theoretically therefore, there are an infinite number of values of P_e , each corresponding with a different mode of buckling.

The value selected above is so called the fundamental mode value and is the lowest critical load producing the single bow buckling condition.

The solution nL = 2< produces buckling in two half – waves, 3< in three half-waves etc.



$$L\sqrt{\frac{P}{EI}} = \pi \quad \text{or} \quad P_1 = \frac{\pi^2 EI}{L^2}$$

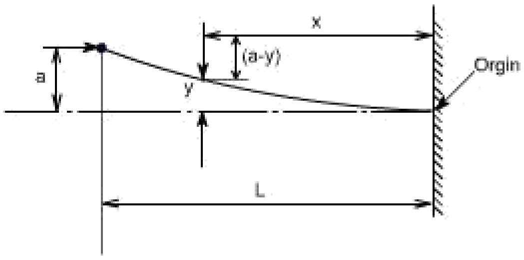
$$\text{If } L\sqrt{\frac{P}{EI}} = 2\pi \quad \text{or} \quad P_2 = \frac{4\pi^2 EI}{L^2} = 4P_1$$

$$\text{If } L\sqrt{\frac{P}{EI}} = 3\pi \quad \text{or} \quad P_3 = \frac{9\pi^2 EI}{L^2} = 9P_1$$

If load is applied sufficiently quickly to the strut, then it is possible to pass through the fundamental mode and to achieve at least one of the other modes which are theoretically possible. In practical loading situations, however, this is rarely achieved since the high stress associated with the first critical condition generally ensures immediate collapse.

struts and columns with other end conditions: Let us consider the struts and columns having different end conditions

Case b: One end fixed and the other free:



writing down the value of bending moment at the point C

$$B.M|_c = P(a - y)$$

Hence, the differential equation becomes,

$$EI\frac{d^2y}{dx^2} = P(a - y)$$

On rearranging we get

$$\frac{d^2y}{dx^2} + \frac{Py}{EI} = \frac{Pa}{EI}$$

Let $\frac{P}{EI} = n^2$

Hence in operator form, the differential equation reduces to $(D^2 + n^2)\ y = n^2a$

The solution of the above equation would consist of complementary solution and particular solution, therefore

y_{gen} = A cos(nx) + sin(nx) + P. I

where

P.I = the P.I is a particular value of y which satisfies the differential equation

Hence $y_{P.I}$ = a Therefore the complete solution becomes Y = A cos(nx) + B sin(nx) + a

Now imposing the boundary conditions to evaluate the constants A and B

(i) at x = 0; y = 0

This yields A = -a

(ii) at x = 0; dy/dx = 0

This yields B = 0 Hence

y = < a cos(nx) + a

Futher, at x = L; y = a

Therefore a = - a cos(nx) + a

or 0 = cos(nL)

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Hence the least solution would be

$nL = 2\pi$

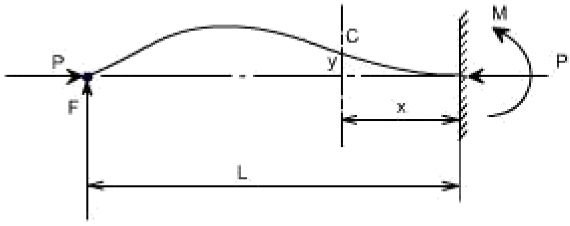
$n.L = \sqrt{\frac{P}{EI}} L = 2\pi$ Thus the buckling load or crippling load is

Now the fundamental mode of buckling in this case would be

$$P_e = \frac{4\pi^2 EI}{L^2}$$

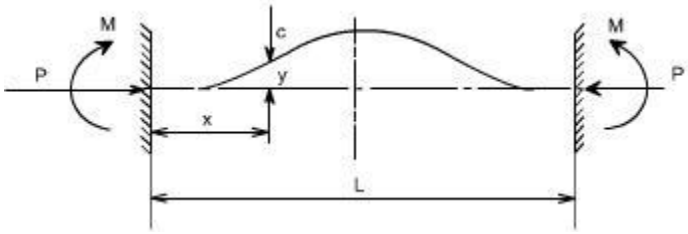
$\sqrt{\frac{P}{EI}}\, L = \frac{\pi}{2}$, Therefore, the Euler's crippling load is given as

$$P_e = \frac{\pi^2 EI}{4L^2}$$



Case 3

Strut with fixed ends:



Due to the fixed end supports bending moment would also appears at the supports, since this is the property of the support.

Bending Moment at point C = M – P.y

<u>One end fixed, the other pinned</u>

In order to maintain the pin-joint on the horizontal axis of the unloaded strut, it is necessary in this case to introduce a vertical load F at the pin. The moment of F about the built in end then balances the fixing moment.

With the origin at the built in end, the B,M at C is given as

$$EI\frac{d^2y}{dx^2} = -Py + F(L - x)$$

$$EI\frac{d^2y}{dx^2} + Py = F(L - x)$$

Hence

$$\frac{d^2y}{dx^2} + \frac{P}{EI}y = \frac{F}{EI}(L - x)$$

In the operator form the equation reduces to

$$\left(D^2 + n^2\right)y = \frac{F}{EI}(L - x)$$

$$y_{particular} = \frac{F}{n^2 EI}(L - x) \text{ or } y = \frac{F}{P}(L - x)$$

The full solution is therefore

$$y = A\,Cos\,mx + B\,Sin\,nx + \frac{F}{P}(L - x)$$

The boundry conditions relevants to the problem are at x=0;y=0

$$\text{Hence } A = -\frac{FL}{P}$$

$$\text{Also at } x = 0; \frac{dy}{dx} = 0$$

$$\text{Hence } B = \frac{F}{nP}$$

$$\text{or } y = -\frac{FL}{P}Cos\,nx + \frac{F}{nP}Sin\,nx + \frac{F}{P}(L - x)$$

$$y = \frac{F}{nP}\left[Sin\,nx - nL\,Cos\,nx + n(L - x)\right]$$

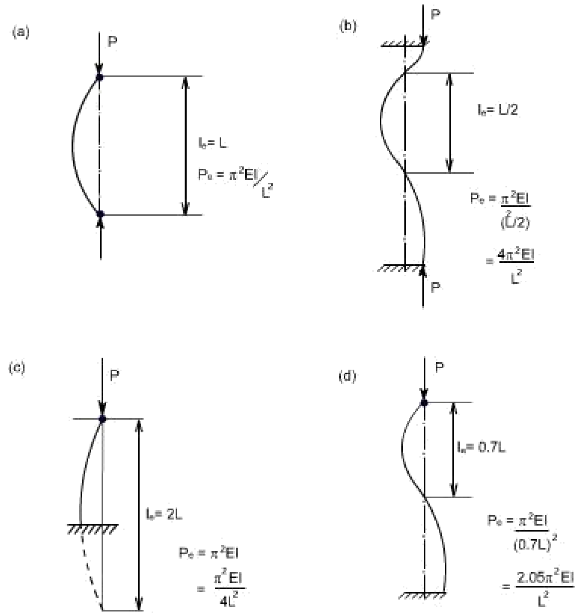
Also when x = L ; y = 0
Therefore
nL Cos nL = Sin nL

The lowest value of nL (neglecting zero) which satisfies this condition and which therefore produces the fundamental buckling condition is nL = 4.49radian

$$\text{or} \sqrt{\frac{P}{EI}}\,L = 4.49$$

$$\frac{P_e}{EI}L^2 = 20.2$$

$$P_e = \frac{2.05\pi^2\,EI}{L^2}$$



Equivalent Strut Length:

$$\text{Euler's stress, } \sigma_e = \frac{P_e}{A} = \frac{\pi^2 EI}{Al^2}$$

But, $I = Ak^2$

$$\sigma_e = \frac{\pi^2 E}{\left(\frac{l}{k}\right)^2}$$

Having derived the results for the buckling load of a strut with pinned ends the Euler loads for other end conditions may all be written in the same form.

$$\text{i.e. } P_e = \frac{\pi^2 EI}{L^2}$$

Where L is the equivalent length of the strut and can be related to the actual length of the strut depending on the end conditions.

The equivalent length is found to be the length of a simple bow(half sine wave) in each of the strut deflection curves shown. The buckling load for each end condition shown is then readily obtained. The use of equivalent length is not restricted to the Euler's theory and it will be used in other derivations later.

The critical load for columns with other end conditions can be expressed in terms of the critical load for a hinged column, which is taken as a fundamental case.

For case(c) see the figure, the column or strut has inflection points at quarter points of its unsupported length. Since the bending moment is zero at a point of inflection, the freebody diagram would indicates that the middle half of the fixed ended is equivalent to a hinged column having an effective length $L_e = L / 2$.

The four different cases which we have considered so far are:

(a) Both ends pinned (c) One end fixed, other free

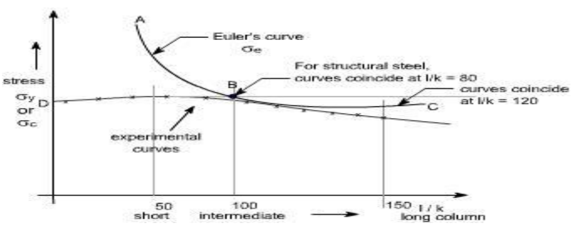
(b) Both ends fixed (d) One end fixed and other pinned

Limitations of Euler's Theory :

In practice the ideal conditions are never [i.e. the strut is initially straight and the end load being applied axially through centroid] reached. There is always some eccentricity and initial curvature present. These factors needs to be accommodated in the required formula's.

It is realized that, due to the above mentioned imperfections the strut will suffer a deflection which increases with load and consequently a bending moment is introduced which causes failure before the Euler's load is reached. Infact failure is by stress rather than by buckling and the deviation from the Euler value is more marked as the slenderness-ratio l/k is reduced. For values of l/k < 120 approx, the error in applying the Euler theory is too great to allow of its use. The stress to cause buckling from the Euler formula for the pin ended strut is

A plot of < $_e$ versus l / k ratio is shown by the curve ABC.



Allowing for the imperfections of loading and strut, actual values at failure must lie within and below line CBD.

Other formulae have therefore been derived to attempt to obtain closer agreement between the actual failing load and the predicted value in this particular range of slenderness ratio i.e.l/k=40 to l/k=100.

(a) Straight – line formulae :

The permissible load is given by the formulae

$P = \sigma_y A\left[1 - n\left(\frac{l}{k}\right)\right]$ Where the value of index 'n' depends on the material used and the end conditions.

(b) Johnson parabolic formulae : The Johnson parabolic formulae is defined as

$P = \sigma_y A\left[1 - b\left(\frac{l}{k}\right)^2\right]$ where the value of index 'b' depends on the end conditions.

(c) Rankine Gordon Formulae :

$$\frac{1}{P_R} = \frac{1}{P_e} + \frac{1}{P_c}$$

Where P_e = Euler crippling load

P_c = Crushing load or Yield point load in Compression

P_R = Actual load to cause failure or Rankine load

Since the Rankine formulae is a combination of the Euler and crushing load for a strut.

For a very short strut P_e is very large hence $1/P_e$ would be large so that $1/P_e$ can be neglected.

$$\frac{1}{P_R} = \frac{1}{P_e} + \frac{1}{P_c}$$

Thus $P_R = P_c$, for very large struts, P_e is very small so $1/P_e$ would be large and $1/P_c$ can be neglected ,hence $P_R = P_e$

The Rankine formulae is therefore valid for extreme values of 1/k.It is also found to be fairly accurate for the intermediate values in the range under consideration. Thus rewriting the formula in terms of stresses, we have

$$\frac{1}{\sigma A} = \frac{1}{\sigma_e A} + \frac{1}{\sigma_y A}$$

$$\frac{1}{\sigma} = \frac{1}{\sigma_e} + \frac{1}{\sigma_y}$$

$$\frac{1}{\sigma} = \frac{\sigma_e + \sigma_y}{\sigma_e . \sigma_y}$$

$$\sigma = \frac{\sigma_e . \sigma_y}{\sigma_e + \sigma_y} = \frac{\sigma_y}{1 + \frac{\sigma_y}{\sigma_e}}$$

For struts with both ends pinned

$$\sigma_e = \frac{\pi^2 E}{\left(\frac{l}{k}\right)^2}$$

$$\sigma = \frac{\sigma_y}{1 + \frac{\sigma_y}{\pi^2 E}\left(\frac{l}{k}\right)^2}$$

$$\sigma = \frac{\sigma_y}{1 + a\left(\frac{l}{k}\right)^2}$$

$$a = \frac{\sigma_y}{\pi^2 EI}$$

Where and the value of ‘a' is found by conducting experiments on various materials. Theoretically, but having a value normally found by experiment for various materials. This will take into account other types of end conditions.

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Remedial classes Time Table

November – 2021

Bachelor of Engineering (Mechanical Engineering)

Student Name	Semester	Subject	Day	Time
SHYAM GANDHARE	3rd Semester	MEA-305 Strength of Material	Saturday	**11:00am-12:30pm**
HARSH SONI	3rd Semester	MEA-305 Strength of Material	Saturday	**11:00am-12:30pm**
ATHARV BANSOD	3rd Semester	MEA-305 Strength of Material	Saturday	**11:00am-12:30pm**
SHIVAM TIWARI	3rd Semester	MEA-305 Strength of Material	Saturday	**11:00am-12:30pm**
RAHUL KUMAR CHOUHAN	3rd Semester	MEA-305 Strength of Material	Saturday	**11:00am-12:30pm**

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HOD

Mechanical Engineering

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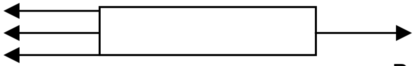
UNIT 1 STRESS, STRAIN AND DEFORMATION OF SOLIDS

1. What is stress?

The internal resistance offered by a body per unit area against deformation is known as stress. The unit of stress is N/mm^2 or N/m^2 When an external force acts on a body, the body tends to undergo deformation. Due to cohesion between molecules the body resist the force. This resistance offered by the body is known as strength of material.

Resistance 

P

Mathematically stress or intensity of stress is written as

$\sigma = \dfrac{P}{A}$ where σ is stress and P is load and A is area ofcross section

Note: 1 N/m^2 =1 Pascal

1 $N/mm^2 = 10^6 N/m^2$

1 bar = $1 \times 10^5 N/m^2$

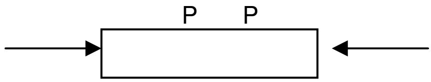
2. What is tensile stress?

Tensile stress: The resistance offered by a body per unit area when it is subjected to a force which acts away from its point of application is called tensile stress.

P

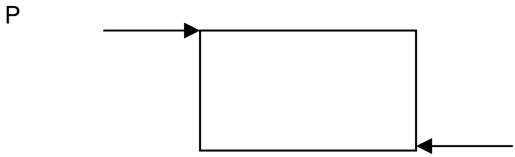
3. What is compressive stress?

Compressive stress: The resistance offered by a body per unit area when it is subjected to a force which acts towards its point of application is called compressive stress.



4. What is shear stress?

Shear Stress: The resistance offered by a body per unit area when the applied load on the body consists of two equal and opposite forces not in the same line is called shear stress.



$\tau = P/A$

where τ is shear stress, P is tangential force and A is area of shearing

5. What is strain?

when a body is subjected to some external force, there is some deformation of the body. The ratio of change of dimension of the body to the original dimension is known as strain. It has no unit.

$$\text{Strain} = \frac{\text{change in length } (\delta\ell)}{\text{original length } (\ell)}$$

6. What is Tensile strain?

The length of the bar increases by an amount under the action of external force P then tensile strain = $\dfrac{\text{increase in length}}{\text{original length}}$

7. What is compressive strain?

The length of the bar decreases by an amount under the action of external force P then compressive strain = $\dfrac{\text{decrease in length}}{\text{original length}}$

8.What is Shear strain?

The distortion produced by shear stress on an element or rectangular block is known as shear strain. It can also be defined as the change in the right angle.

9.What is volumetric strain?

The ratio between the change in volume and the original volume is known as volumetric stain.

$$\text{Volumetric strain} = \frac{\text{change in volume}}{\text{original volume}}$$

10. Define True stress and True Strain

The true stress is defined as the ratio of the load to the cross section area at any instant.

$$(\varepsilon_T) = \int_{L_o}^{L} \frac{dl}{l} = \ln\left(\frac{L}{L_o}\right) = \ln(1+\varepsilon) = \ln\left(\frac{A_o}{A}\right) = 2\ln\left(\frac{d_o}{d}\right)$$

or engineering strain $(\varepsilon) = e^{\varepsilon_T} - 1$

11. Define Hooke's law?

Within the elastic limit, when a body is loaded, then stress induced is proportional to the strain. This is called as Hook's law.

12. What is linear strain?

The ratio of increase or decrease in length to the original length is called as linear strain.

13. What is lateral strain?

The ratio of increase or decrease in lateral dimensions to the original lateral dimensions is called as lateral strain.

14.What are the types of elastic constants?

- Modulus of elasticity or Young's modulus
- Modulus of rigidity or shear modulus
- Bulk modulus

15. What is poison’s ratio?

When a member is stressed with in elastic limit, the ratio of lateral strain to its corresponding linear strain remains constant throughout the loading. This constant is called as poison’s ratio. It is the ratio of lateral strain to longitudinal or linear strain.

16. What is the inter relationship between the three constants?

$$E = 2G(1+\mu) = 3K(1-2\mu) = \frac{9KG}{3K+G}$$

Where, E = Young’s modulus in N/mm^2
K = Bulk modulus in N/mm^2
G = Modulus of rigidity in N/mm^2 μ Poisson’s ratio

17. Define bulk modulus?

When a body is stressed the ratio of direct stress to the corresponding volumetric strain is constant with in elastic limit. This constant is called as bulk modulus. Bulk modulus is the ratio of direct stress to volumetric strain.

18. Define modulus of elasticity?

Modulus of elasticity is the ratio of stress to strain.

19. Define factor of safety?

Factor of safety is defined as the ratio of ultimate stress to the working stress (permissible stress).

20.What is elasticity?

The deformation produced due to the application of external load disappears completely with the removal of the load. This property of the material is called as elasticity.

21.What is elastic limit?

Elastic limit is the limiting value of the load up to which the material returns back to its original position. Beyond this load, the material will not return back to its original position.

22What are thermal stresses and strain?

Whenever there is increase or decrease in the temperature of the body, the body tends to expand or contract. If this deformation is prevented, some stresses are induced in the body, these stresses are called as thermal stresses or temperature stresses. The corresponding strains are thermal strain or temperature strains. Thermal stress is $\sigma_t = \alpha\ T\ E$ where α is co-efficient of linear expansion, T is rise in temperature E is young's modulus

Temperature stain or thermal strain = $\dfrac{\text{Extension prevented}}{\text{original length}}$

Extension prevented $= \alpha\, T\, L$
So thermal strain is $e_t = \alpha\, T$

23.If the values of E and μ for an alloy body is 150 GPa and 0.25 respectively, find out the value of bulk modulus for the alloy?

Bulk modulus, $K = (mE) / [3(m-2)] = 100 \times 10^{3}\ N / mm^{2}$

24. Differentiate between Ultimate stress and working stress?

Ultimate stress is the maximum value of stress up to which the material withstand its failure. Working stress is the maximum stress allowed to setup in a material in actual practice.

25. What is a compound or composite bar?

A bar made of two or more different materials, joined together is called a compound or composite bar.

26. Write the Compatibility equation for solving compound bar problems

The extension or contraction in each bar is equal. Hence deformation per unit length i.e. strain in each bar is equal.

$$\delta\ell = \delta\ell_1 = \delta\ell_2 = \delta\ell_3$$

$\delta\ell = \dfrac{P\ell}{AE}$ Where P is load ℓ is length of the section

A is area of cross section, E is young's modulus

2. The total external load on the composite bar is equal to the sum of the loads carried by each different material

$P = P_1 + P_2 + P_3$

$P_1 = \sigma_1 A_1$ Where σ is stress induced and A_1 is area of cross section

27. Write Thermal stresses in composite bars(Procedure for finding thermal stresses in composite bar)

1. If a compound bar made up of different materials is subjected to a change in temperature there will be a tendency for the compound parts to expand different amounts due to the unequal coefficients of thermal expansion. If the parts are constrained to remain together then **the actual change in length must be the same for each**. This change is the resultant of the effects due to temperature and stress conditions.

$$\alpha_1 T\, L + \frac{\sigma_1}{E_1} L = \alpha_2 T\, L - \frac{\sigma_2}{E2} L$$

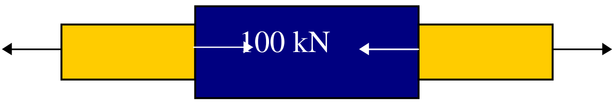
1. For equilibrium the resultant force acting over any cross section must be equal.

$$\sigma_1 A_1 = \sigma_2 A_2$$

28 .What is principle of super position?

When a body is subjected to number of forces acting on different sections along the length of body, then the resulting deformation of the body is equal to the algebraic sum of the deformations of the individual sections. This is called principle of super position.

29.Find the magnitude of 'P' of a compound bar?



100

Sum of all the forces acting in left direction = Sum of all the forces acting in right direction.

Therefore, 100 + P = 100 + 50

P = 50 kN.

30. How will you calculate the total elongation of a compound bar which is connected in series?

The total elongation of a compound bar connected in series can be computed by the relation

$$= \delta l_1 + \delta l_2 + \delta l_3 + \ldots + \delta l_n$$

$$\delta l = \frac{P_1 L_1}{A_1 E_1} , \frac{P_2 L_2}{A_2 E_2} + \ldots + \frac{P_n L_n}{A_n E_n}$$

where, □l_i is the deformation on individual bar in the system.

31.what do you mean by a bar of uniform strength:
A bar having uniform stress when it is subjected to its own weight is known as a bar of uniform strength.

32. Expression for the total elongation of uniformly tapering rectangular bar when it is subjected to an axial load P

$$\delta \ell = \frac{PL}{Et(a-b)} \log_e \frac{a}{b}$$

where L- Total length of the bar t- thickness of the bar a – width at bigger bar b- width at smaller end **E-** Young's modulus

33.What is meant by free body diagram?

A free body diagram is a complete diagram or a simplified sketch that shows all the external forces with the direction and the point of application of external load. This includes all the reactive forces by the supports and the weight of the body due to its mass.

34.Define elastic strain energy?

If the material is loaded within the elastic limit and then unloaded to zero stress, the strain also becomes zero and the strain energy stored in the body in straining the material is recoverable. However, when the material is loaded beyond the elastic limit and then unloaded, some permanent deformations will be setup in the body even after unloading. Therefore, only the partial strain energy will be recoverable and is called elastic strain energy.

36.What do you mean by strain energy density?

Strain energy density is defined as the strain energy per unit volume of the material. It is actually the area under the stress-strain curve.

37.Define Proof load.

The maximum load which can be applied to a body without permanent deformation is called proof load.

38.Define resilience.

Resilience is defined as the capacity of a material to absorb energy upon loading.

39.Define modulus of resilience.

Modulus of resilience is defined as the energy per unit volume that the material can absorb without yielding.

40.Define toughness of a material.

Toughness is defined as the maximum strain energy that can be absorbed per unit volume till rupture.
The modulus of toughness is a measure of the resistance of the structure to impact loading and is dependent on the ductility of the material.

41.What are the major types of deformation?

Elastic deformation (deformation due to loads)
Thermal deformation (deformation due to temperature variation)

42.What is meant by residual stresses?

In reality, when materials are being manufactured, they are often rolled, extruded, forged, welded and hammered. In castings, materials may cool unevenly.
These processes can setup high internal stresses called residual stresses. Note:
This process causes the development of larger normal stresses

near the outer surface than in the middle.
These residual stresses are self-equilibrating. i.e. they are in equilibrium without any externally applied forces.
In real world problems, such residual stresses may be large and should be carefully investigated and then added to the calculated stresses for the initially stress-free material.

43.Strain Energy

The energy required to deform an elastic body is known as strain energy.

U = $\frac{1}{2}$ P x

U = $\frac{\sigma^2}{2E} AL$ Where AL is the volume of the bar

44. Resilience: The strain energy stored per unit Volume is usually known as Resilience

45. Proof Resilience: The strain energy stored per unit volume upto elastic limit is known as proof resilience.

46. Expression for strain energy stored in a body when the load is applied gradually

U = $\frac{\sigma_1^{\,2}}{2E} AL$

47. Expression for strain energy stored in a body when the load is applied suddenly

U = $\frac{\sigma^2}{2E} AL$ where $\sigma = 2\ \sigma_1$ i.e., the maximum stress induced due to suddenly applied load is two times gradually applied load.

48. Expression for strain energy stored in a body when the load is applied with impact

U = $\frac{\sigma^2}{2E} AL$ where

σ = $\frac{P}{A}\left(1+\sqrt{1+\frac{2AEh}{PL}}\right)$ Where P – load dropped or impact load, L- Length of the rod A area of cross section, h- height through which load is dropped

49. Expression for strain energy stored in a body due to shear.

U = $\frac{\tau^2}{2C} AL$ Where τ is shear stress,C is rigidity modulus

50. How will you calculate major principal stress on member subjected to like principal stresses and shear stress?

Major normal principal stresses

$$,\sigma_{n_1} = \frac{\sigma_1+\sigma_2}{2} + \sqrt{\left(\frac{\sigma_1-\sigma_2}{2}\right)^2 + \tau^2}$$

51. How will you calculate minor principal stress on member subjected to like principal stresses and shear stress?

Minor normal principal stresses

$$,\sigma_{n2} = \frac{\sigma_1+\sigma_2}{2} - \sqrt{\left(\frac{\sigma_1-\sigma_2}{2}\right)^2 + \tau^2}$$

52. What is the use of Mohr's circle?

This is a graphical method which is frequently used to find out the normal, tangential, resultant stresses, and principal planes for the given stresses on oblique plane.

53.What do you mean by limit of proportionality or elastic limit?

Limit of proportionality or elastic limit is a point in the stress-strain curve at which the linear relation between them ceases. (i.e. the point at which the straight line changes to a curve). Thereafter the stress is not directly proportional to strain and therefore *Hooke's law is not valid after the elastic limit*. Also this is the point at which material undergoes rearrangement of molecular structure, in which atoms are being shifted to some other stable configuration.

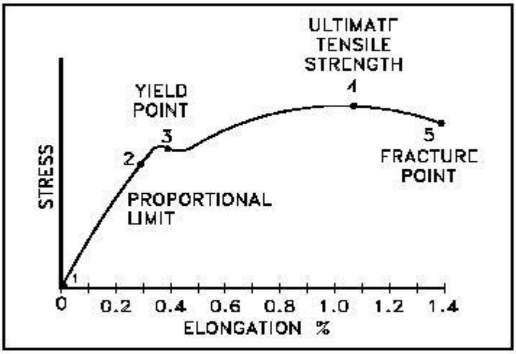


Figure 1.1 Stress-Strain Curves

54. What do you mean by the term “necking”?
When a material is being loaded to its yield point, the specimen begins to “neck” (i.e. the cross sectional area of the material start decreasing) due to plastic flow. Therefore Necking can be defined as the mode of ductile flow of material in tension. Necking usually occurs where the surface imperfections are predominant.

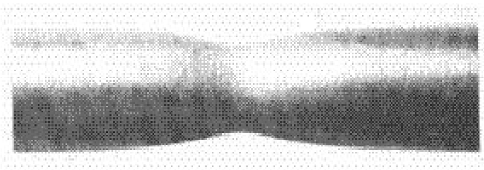


Figure 1.2 Necking

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UNIT – II

Transverse Loading on Beams and Stresses in Beam

1. What is a beam?

   A beam is a structure member supported along its length and subjected to various types of loadings acting vertically downwards (perpendicular to the centre of the beam).

2. Classify beams based upon its supports?

   - Cantilever beam
   - Simply supported beam
   - Overhanging beam
   - Fixed beam
   - Continuous beam
   - Propped cantilever beam

3. What is cantilever beam?

   A beam which is fixed at one end and free at other end is called a cantilever beam.

4. What is simply supported beam?

   A beam which is resting freely on the supports at both the ends is called a simply supported beam.

5. What are the various types of loading?

   - Point or concentrated load
   - Uniformly distributed load (UDL)
   - Uniformly Varying load (UVL)

6. What is fixed beam?

   A beam which is fixed at both the ends or built up in halls is called as a fixed beam.

7. What is overhanging beam?

   A beam in which one or both the ends are extended beyond the supports is called as a overhanging beam.

8. What is continuous beam?

A beam which is supported by more than two supports is called continuous beam.

9. What is point load?

A load which is applied at particular point is called as point or concentrated load.

10. What is mean by uniformly distributed load?

Uniformly distributed load is a load which is uniformly spread over the given span or length of the beam, at the rate of loading w in N/m.

11. What is mean by uniformly varying load?

Uniformly varying load which is spread over a beam in such a manner that the rate of loading uniformly increases from zero to N/m through the span or length at a constant rate.

12. What is shear force?

Shear force at a cross section is defined as the algebraic sum of all the forces acting either side of beam.

13. What is Bending moment?

Bending moment at a cross section is defined as the algebraic sum of moments of all the forces which are placed either side from the point.

14. What is meant by Sagging moment?

A bending moment in which the force in left side of beam is clockwise and right side of the beam is counter clockwise is called Sagging or positive moment.

15. What is meant by Hogging moment?

A bending moment in which the force in left side of beam is counter clockwise and right side of the beam is clockwise is called Hogging or negative moment.

16. What are shear force diagram (SFD) and Bending moment diagram (BMD)?

Shear force diagram (SFD) is a diagram which shows the variation of shear force along its length of beam.

Bending moment diagram (BMD is a diagram which shows the variation of bending moment along its length of beam.

17. What is meant by point of contraflexure?

Point of contraflexure is a point on a loaded beam at which the bending moment changes its sign or is zero.

18. Give the relationship between shear force and bending moment? The rate of change of bending moment equals to the shear force at the section. Mathematically, $\frac{dM}{dx} = -F$

19. State any two assumptions made in theory of bending?

- The material is perfectly homogeneous and isentropic.
- The Young's modulus is same in tension as well as compression.

20. Write bending equation and explain the terms?

The bending equation is given as $\frac{M}{I} = \frac{\sigma_b}{y} = \frac{E}{R}$

Where, M = Bending moment in N mm
I = Moment of inertia in mm^4
σ_b= Bending stress in N/mm^2
y = Distance from neutral axis in mm
E = Young's modulus in N/mm^2
R = Radius of curvature in mm.

21. What is section modulus?

Section modulus is the ratio of moment of inertia of the section to the distance from the neutral axis.

Section modulus (Z) = $\frac{I}{y}$

Where, I = Moment of inertia in mm^4
y = Distance from neutral axis in mm.

$$Z = \frac{\pi d^3}{32} \text{ (for solid circular sections)}$$

$$Z = \frac{\pi (D^4 - d^4)}{32 D} \text{ (for hollow circular sections)}$$

22. What are flitched or composite beam?

A beam which is constructed by two different materials and behave as a single unit during loading is called a flitched or composite beam.

23. What is simple or pure bending?

If a beam is bent only due to application of constant bending moment and not due to shear then it is called simple or pure bending.

24. What do you mean by beam of uniform strength?

A beam in which bending stress developed is constant and is equal to the allowable stress at every section is called beam of uniform strength.

25. When will bending moment be maximum?

Bending Moment will be maximum when shear force is zero.

26. What is maximum bending moment in a simply supported beam of span 'L'
subjected to UDL of 'w' over entire span?

Max BM = $\dfrac{WL^2}{8}$

27. In a simply supported beam how will you locate point of maximum bending
moment?

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The bending moment is max. When Shear Force is zero. Write SF equation at that point
and equate to zero, the distance ‘x’ from one end can be found. Substituting the value of x in moment equation the maximum moment can be found

28. What is shear force and bending moment diagram?

The digram which shows the variation of the shear force and bending moment along the length of the beam.

29. Write the assumption in the theory of simple bending?

1. The material of the beam is homogeneous and isotropic.
2. The beam material is stressed within the elastic limit and thus obeys Hook’s law.
3. The transverse section which was plane before bending remains plains after bending also.
4. Each layer of the beam is free to expand or contract independently about the layer, above or below.
5. The value of E is the same in both compression and tension.

30.Comment on Load Carrying capacity of beams?

The strength of the section or the load carrying capacity of a beam does not depend upon the sectional area provided but upon the disposition of that area in relation to its neutral axis. In other words, the strength of beam directly depends on the section-modulus ‘Z’ of the beam.

31. What do you mean by shear flow?

Shear flow is defined as the longitudinal force per unit length transmitted across the
section at level ‘y1’ from the neutral axis.
If the shear stress is multiplied by the corresponding width of the section, the quantity obtained is known as shear flow. It is denoted

by ‘q’ and is given by q = τ. z (here ‘z’ denotes the width of the section corresponding to that layer)

32. How will you calculate the value of shear stress at a particular distance from the neutral axis?

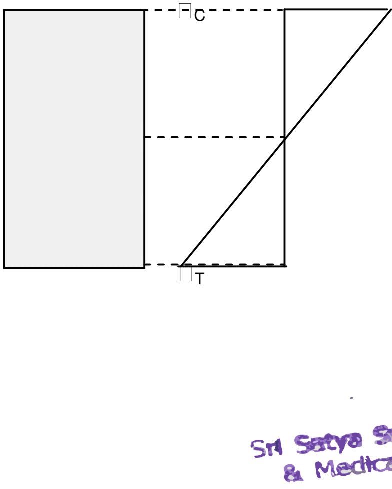
$$\tau = \frac{V.A'.\bar{y}}{I.Z}$$

Here, ‘V’ is the corresponding shear force at a particular distance from the neutral axis, A’ is the partial area of the section, ‘$\bar{y}$’ is the moment arm of this partial area with respect to neutral axis, ‘I’ is the moment of inertia of the section and ‘Z’ is the corresponding width of the layer or fiber and ‘ τ ’ is the shear stress at a particular distance from the neutral axis.

33.Draw the bending stress variation of a simply supported beam.

The value of bending stress (N/mm^2) is zero at the level of neutral axis and maximum at the extreme fiber of the cross-section of the beam. The bending stress is always proportional to the distance of the fiber from the neutral axis. The value of bending stress increases as the distance of the fiber increases.

Above the neutral axis, the beam experiences compressive stress and at the same time it is subjected to tensile stress below the neutral axis. The bending stresses always cause the member to bend in the transverse direction.



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UNIT 3

TORSION OF CIRCULAR SHAFT & SPRINGS

1. What is power?

Power can be defined as the rate of transferring energy. It is calculated as

$$P = T \times 'n'$$

where, P is the power, T is the torque and 'n' is the rotational speed.

2. What do you mean by Torsion?

Torsion refers to the loading of a circular or non-circular member that tends to cause it to rotate or twist. Such a load is called torque, torsional moment, rotational moment, twisting moment or simply couple.

3. What are the assumptions made in Torsion equation

- The material of the shaft is homogeneous, perfectly elastic and obeys Hooke's law.
- Twist is uniform along the length of the shaft
- The stress does not exceed the limit of proportionality
- The shaft circular in section remains circular after loading
- Strain and deformations are small.

4. Write the governing equation for torsion of circular shaft?

$$\frac{T}{I} = \frac{\tau}{R} = \frac{G\theta}{L}$$

where, T-Torque; J- Polar moment of inertia; G-Modulus of rigidity; L- Length of the shaft; τ- Shear stress; R- Radius of the shaft.

5. What is the type of stress induced in a structural member subjected to torsional loading?

Shear Stress. The variation of shear stress is linear and it vary from zero at the neutral axis and reaches the maximum value at the extreme fiber of the shaft.

i.e. shear stress $\propto$ radius

6. Define polar moment of inertia and establish the equations for a solid and hollow circular shaft.

Polar moment of inertia can be defined as

$$J = \frac{\pi D^4}{32} \quad \text{(solidcircularshaft)}$$

$$J = \frac{\pi (D^4 - d^4)}{32} \quad \text{(hollowcircularshaft)}$$

7. Define polar modulus?

Polar modulus can be defined as

$$Z_p = \frac{\pi D^3}{16} \quad \text{(solidcircularshaft)}$$

$$Z_p = \frac{\pi (D^4 - d^4)}{16D} \quad \text{(hollowcircularshaft)}$$

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8. Why the shear stress is maximum at the outer surface of the shaft than the inner core?

When the circular shaft is subjected to torsional loading, the shear stress is maximum at the extreme fiber of the shaft. This is due to the reason that, the extreme fibers are much strained than the inner surface near centroidal axis of the member. This is the reason why the shear stress is maximum at the extreme fiber of the shaft. Also the materials inside the shaft are not that much utilized at the time of torsional loading. Also it this is the reason why hollow circular shafts are preferred rather than the solid one for practical use.

9. Why hollow circular shafts are preferred when compared to solid circular shafts?

- The torque transmitted by the hollow shaft is greater than the solid shaft.
- For same material, length and given torque, the weight of the hollow shaft will be less compared to solid shaft.

10. What is torsional stiffness?

The measure of torsional stiffness is the angle of twist of one part of a shaft relative to another part when a certain torque is applied.

11. What are various types of rigidity modulus?

- Flexural rigidity (EI)
- Torsional rigidity (GJ)
- Plate rigidity

12. Define spring?

A spring is an elastic member, which deflects under the action of load and regains its original shape after the removal load.

13. What are the various types of springs?

- Disc spring (or) Belleville spring
- Leaf spring
- Spiral spring
- Helical spring

Helical springs can be again classified into

- Open coil helical spring
- Closed coil helical spring

14. State any two major functions of a spring.

- To absorb the shock energy
- To measure forces in spring balance and engine indicators

15. Define pitch?

Pitch of the spring is defined as the axial distance between the adjacent coils in uncompressed state. Mathematically it can be calculated as

Pitch = (length/ (n-1)) where, n

is the number of turns available in the coil.

16. What is spring index (C)?

The ratio of pitch or mean diameter to the diameter of wire for the spring is called the spring index.

17. What is solid length?

The length of a spring under its maximum compression is called its solid length. It is the product of total number of coils and the diameter of wire. It is usually denoted by the symbol L_s.

18. Define free length.

Free length of the spring is the length of the spring when it is free or unloaded condition. It is equal to the solid length plus the maximum deflection or compression plus clash allowance.

L_f = solid length + Y_{max} + 0.15 Y_{max}

19. Define stiffness of spring or spring rate.

The spring stiffness or spring constant is defined as the load required per unit deflection of the spring

20. Define helical springs.

The helical springs are made up of a wire coiled in the form of a helix and are primarily intended for compressive or tensile load. Closed coil springs are meant for taking tensile load (springs balance) and the other one is for taking compressive load (Shock observer).

21. What are the differences between closed coil & open coil helical springs?

Closed coil helical spring	Open coil helical spring
Meant for tensile load	Meant for compressive load
The spring wires are coiled very closely, each turn is nearly at right angles to the axis of helix	The wires are coiled such that there is a gap between the two consecutive turns.
Helix angle is less than 10^o	Helix angle is large ($>10^o$)

22. What are the various stresses induced in the open coil helical spring?

- Torsional shear stress
- Direct shear stress
- Stress arises due to curvature

23. What is buckling of springs?

The helical compression spring behaves like a column and buckles at a comparative small load when the length of the spring is more than 4 times the mean coil diameter

24. What is buckling of springs?

The helical compression spring behaves like a column and buckles at a comparative small load when the length of the spring is more than 4 times the mean coil diameter.

25. What is surge in springs?

The material is subjected to higher stresses, which may cause early fatigue failure. This effect is called as spring surge.

26. Define active turns.

Active turns of the spring are defined as the number of turns, which impart spring action while loaded. As load increases the no of active coils decreases.

27. Define inactive turns.

An inactive turn of the spring is defined as the number of turns which does not contribute to the spring action while loaded. As load increases number of inactive coils increases from 0.5 to 1 turn

UNIT – IV Deflection of Beams

1. What are the important methods used to find slope and deflection?

   - Double integration method
   - Macaulay's method
   - Moment – area method
   - Conjugate beam method

2. What is the disadvantage of double integration method?

   In double integration method, if there are more loads at different sections, then functions will be needed to represent the bending moment and hence additional constants, and a corresponding number of equations will be required resulting in rather lengthy computations.

3. What is the use of moment area method?

   Moment area method is very much useful to find the deflection and slope of a beam at any particular point on the beam. This method can be applied all types of loads or beams of variable cross section.

4. Where does the maximum deflection occur on cantilever beam?

   For cantilever beam having any load or any cross section along the length of the beam, the maximum deflection occurs only at the free end of the beam.

5. Where does the maximum deflection occur for the simply supported beam loaded symmetrically about mid point and having same cross – section through their length?

   The maximum deflection occurs at the centre.

6. State first moment – area theorem (or) Mohr's I theorem (or) One moment area theorem?

   The change of slope between any two parts on the beam is equal to the net area of the M / EI diagram between these two points.

7. State second moment – area (or) Mohr's II theorem?

The tangential deviation between two points on the elastic curve is equal to the areas of the M / EI diagram between that two points about any vertical line.

8. State Castigliano's theorem?

In any beam subjected to any load system the deflection at any point r is given by the partial differential of the total strain energy stored with respect to a force P_r acting at a point r.

9. State conjugate theorem I?

The slope at any section of a loaded beam is equal to the shear force at the corresponding section of the conjugate beam.

10. State conjugate theorem II?

The deflection at any section of a loaded beam is equal to the bending moment at the corresponding section of the conjugate beam.

11. Write the flexural equation?

The flexural equation for the beam is $\frac{d^2y}{dx^2} = \frac{M}{EI}$

12. Write the maximum slope and deflection when simply supported beam of length of l has only one central load W?

Maximum slope $\theta_{max} = \frac{Wl^2}{16EI}$

Maximum Deflection $y_{max} = \frac{Wl^3}{48EI}$

13. What is flexural rigidity?

The product of modulus of elasticity and moment of inertia is called as flexural rigidity.

14. Why deflection of beams is needed for engineering applications like mechanical engineering?

The spindle of a lathe or drill press and the arbor of a milling machine carry cutting tools for machining metals. Therefore the deflection of the spindle would have an adverse effect on the accuracy of the machine output. The manner of loading and support of these machine elements behave like that of a real beam. This is the reason why deflection of beams is necessary for engineering applications like mechanical engineering.

15. Describe the boundary conditions that can be used for finding out the values of the constants of integration in case of common type of beams.

Support	Deflection	Slope	Moment
Fixed end	Zero	Zero	Yes
Free end	Yes	Yes	Zero
Roller (i.e. pinned or hinged)	Zero	Zero	Zero

16.Define the term slope.

Slope is defined as the rotation of the beam axis from its original position.

17.Define deflection.

The displacement of a particular point located in the longitudinal axis of the beam in the vertical direction is called deflection. Deflection may be either upward or downward depending upon the direction of the load which is acting on the beam

18.Write down the moment – curvature relationship?

$$EI \frac{d^2 y}{dx^2} = M$$

where M is the bending moment, EI is the flexural rigidity and ‘y’ is the deflection of the beam.

19.Explain the procedure of finding the slope and deflection of a beam using Macaulay’s method?

- Find the reaction at the supports
- Take a section at a distance ‘x’ from the left support such that it covers all the loads in the beam.
- Form the moment – curvature expression that relates the bending moment
- Integrate the moment curvature expression twice to obtain the expressions for slope and deflection.
- Apply the boundary conditions and the find the constants involved in the moment – curvature expression.
- Find the slope and deflection at various points by substituting the value for ‘x’.

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20.List out the relationship exists between slope, deflection, bending moment and the load.

$$\text{Slope} = \frac{dy}{dx}$$

$$\text{Bending Moment} = EI \frac{d^2 y}{dx^2}$$

$$\text{Shear Force} = \frac{d^3 y}{}$$

dx^3

$$\text{Load} = \frac{d^4 y}{dx^4}$$

21 Write down the two Moment – Area theorems?

The angle between the tangents at two points A and B of a deflection curve is equal to the area of the M/EI diagram between A and B.

The displacement of B from the tangent at A is equal to the moment of the M/EI diagram between A and B about the point B.

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DEPARTMET OF CSE

6TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MIDE TERM EXAM- MAX MARKS30					REMARK
			SUBJECT CODE					
			CSA-601	CSA -602	CSA -603	CSA -604	CSA - 605	
1	190101023001	SURAJ KUMAR	20	25	19	19	21	
2	190101033001	AKASH TAVNIYA	22	20	17	23	19	
3	190101033002	ARPANRAMSINGH	18	21	21	17	18	
4	190101033003	SHIVANG PURI	15	17	20	21	20	
5	190101033004	SOURABH VERMA	23	21	19	25	21	
6	190101033005	LOKESH RATHORE	17	20	19	20	17	
7	190101033006	KHUSHI SHARMA	21	19	23	22	21	
8	190101033007	SHIVAM SHARMA	20	16	21	24	20	
9	190101033008	MAJID ALI	20	23	19	20	19	
10	190101033009	SUMIT KUMAR	22	20	18	22	16	
11	190101033010	PRANJAL SINGH	24	20	20	18	23	
12	190101033011	SANDEEP MEWADA	20	18	21	19	20	
13	190101033012	MANALI RATHORE	22	19	17	23	20	
14	190101033014	SHALU GORAKHWAR	18	24	15	17	18	
15	190101033015	HAMZA IQBAL ZARIWALA	19	21	19	21	19	
16	190101033016	SONU VISHWAKARMA	23	20	19	20	17	
17	190101033017	RAHUL	15	19	16	20	21	
18	190101033018	AKHLESH MAHESHWARI	21	19	23	22	17	
19	190101033019	MOHIT SHARMA	20	23	20	23	21	
20	190101033020	UMA VERMA	20	21	20	20	24	
21	190101033021	UMANG VINODA	22	19	18	20	20	
22	190101033022	UDIT KUMAR	24	18	19	18	22	
23	190101033023	FOOL SINGH GURJAR	20	20	17	19	17	
24	190101033024	ARJUN MALVIYA	22	21	21	17	21	
25	190101033025	AYUSH KUMAR TORIA	23	17	17	21	20	
26	190101033026	MOHD TALIB QURESHI	17	21	21	20	19	
27	190101033027	SWATI SHARMA	21	20	24	19	19	
28	190101033028	HARIOM CHANDRAWANSHI	20	19	20	19	23	
29	190101033029	AYUSHI THAKUR	20	16	22	23	21	
30	190101033030	AMIT BHATTACHARYA	22	23	23	21	19	

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31	190101033031	VIKASH KUMAR	24	20	17	19	18	
32	190101033036	NITIN KRISHNAN	20	20	21	18	20	
33	190101033037	VIKRANT AMBASTA	22	18	20	20	22	
34	190101033039	AKASH JADON	18	19	20	21	18	
35	190101035001	MD MAHTAB ALAM	14	17	22	17	19	
36	190101035002	ARWAZ ABDIN	23	21	24	21	23	
37	190101035003	ABHIJEET PRADEEP SHINDE	17	20	20	20	17	
38	190101033038	AJIT KUMAR	15	19	17	19	21	
39	190101035010	JADHAV VAISHALI GORKSHANATH	24	19	21	20	24	
40	190101033040	PRAVEEN RAJAWAT	20	23	20	19	20	
41	190101033041	SANDEEP	22	17	20	19	22	
42	190101033042	RAJNEESH KUMAR	23	21	22	23	23	
43	190101033043	SACHIN SEN	17	20	24	21	23	
44	190101033044	AMAN SINGH	21	19	20	19	21	
45	190101033045	ANJALI PRAJAPATI	20	19	22	18	19	
46	190101033046	KAPIL	20	23	18	20	18	
47	190101033047	GAJENDRA	22	21	19	21	20	
48	190101033048	MANISH KUMAR SINGH	24	19	22	17	21	
49	190101033049	DEBASISH DOLAI	20	18	24	21	17	
50	190101033050	SURYABHAN MISHRA	17	20	20	20	21	
51	190101033051	RAJ SINGH	21	21	22	20	20	
52	190101033052	MURARI LAL	20	17	18	20	24	
53	190101033053	MANOJ KUMAR CHAUHAN	20	21	19	18	20	
54	190101033054	AMIT BOPCHE	22	20	23	19	22	
55	190101033055	VISHAL KURMI	24	20	17	17	17	
56	190101033056	NEHA PORWAL	20	20	21	21	21	
57	190101033057	NEHA SONI	22	18	24	20	20	
58	190101033058	AMIT KHATEEK	18	19	21	19	19	
59	190101033059	RAKESH KUMAR	19	17	20	19	19	
60	190101033060	SHADAB HUSSAIN	22	21	20	23	23	
61	190101033061	SUSHEEL	24	20	22	17	21	
62	190101033062	HARISH PANCHESHWAR	20	19	21	22	18	
63	190101033063	AMIT KUMAR YADAV	22	19	20	24	22	
64	190101033064	PANKAJ MEWADA	18	23	19	20	20	
65	190101033065	PANKAJ BANKHEDE	19	17	19	22	20	
66	190101033066	CHOUDHRI AMOL VILAS	23	21	23	18	21	
67	190101033067	SONALI SONKAR	17	20	21	19	20	
68	190101033068	TABISH AHMAD	21	21	19	22	22	
69	190101033069	AMIT CHOUDHURY	24	17	18	24	20	
70	190101033070	PAWAN KUMAR SHARMA	21	21	20	20	22	

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71	190101033071	GANDHI JAYKUMAR JIGNESHBHAI	20	20	22	24	22	
72	190101033072	SHUBHRANSHU SRIVASTAV	20	19	20	22	18	
73	190101033073	KAMAL KISHOR MISHRA	22	16	18	20	17	
74	200101035011	SONY KUMARI GUPTA	21	20	21	17	21	
75	200101035001	TANU	19	22	24	21	19	
76	200101035002	SHREYA ANURAG	18	17	21	20	18	
77	200101035003	HARSHIT RATHOR	20	21	20	19	20	
78	200101035004	BHOLA NATH BHANDARI	21	20	23	19	21	
79	200101035005	AJAY BHATUNIYA	17	19	21	23	17	
80	200101035006	SHRESTH KR MISHRA	21	19	18	21	21	
81	200101035007	NAVEEN KUMAR	20	23	22	18	20	
82	200101035010	ADITYA KUMAR KUMIL THAKUR	20	21	18	17	19	

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6TH SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS 60					REMARK
			SUBJECT CODE					
			CSA-601	CSA-602	CSA -603	CSA -604	CSA-605	
1	190101023001	SURAJ KUMAR	45	47	39	41	40	
2	190101033001	AKASH TAVNIYA	40	45	40	45	35	
3	190101033002	ARPANRAMSINGH	35	37	35	39	40	
4	190101033003	SHIVANG PURI	41	42	38	44	42	
5	190101033004	SOURABH VERMA	39	45	34	48	38	
6	190101033005	LOKESH RATHORE	44	40	44	42	41	
7	190101033006	KHUSHI SHARMA	48	40	47	37	34	
8	190101033007	SHIVAM SHARMA	42	38	40	35	44	
9	190101033008	MAJID ALI	37	44	37	39	48	
10	190101033009	SUMIT KUMAR	35	41	42	40	42	
11	190101033010	PRANJAL SINGH	39	45	45	35	37	
12	190101033011	SANDEEP MEWADA	40	39	40	38	35	
13	190101033012	MANALI RATHORE	35	44	40	34	39	
14	190101033014	SHALU GORAKHWAR	38	48	34	44	40	
15	190101033015	HAMZA IQBAL ZARIWALA	34	42	44	47	35	
16	190101033016	SONU VISHWAKARMA	44	33	47	40	38	
17	190101033017	RAHUL	47	35	40	37	34	
18	190101033018	AKHLESH MAHESHWARI	40	39	37	42	44	
19	190101033019	MOHIT SHARMA	37	40	42	45	47	
20	190101033020	UMA VERMA	42	35	45	40	40	
21	190101033021	UMANG VINODA	30	40	42	40	37	
22	190101033022	UDIT KUMAR	40	42	40	45	42	
23	190101033023	FOOL SINGH GURJAR	40	38	42	40	35	
24	190101033024	ARJUN MALVIYA	38	39	44	40	39	
25	190101033025	AYUSH KUMAR TORIA	44	44	41	38	40	
26	190101033026	MOHD TALIB QURESHI	41	48	42	44	35	
27	190101033027	SWATI SHARMA	45	42	45	41	38	
28	190101033028	HARIOM CHANDRAWANSHI	32	37	40	45	34	
29	190101033029	AYUSHI THAKUR	44	35	40	39	44	
30	190101033030	AMIT BHATTACHARYA	48	39	38	44	47	
31	190101033031	VIKASH KUMAR	42	40	44	48	40	

32	190101033036	NITIN KRISHNAN	37	35	41	42	37	
33	190101033037	VIKRANT AMBASTA	35	38	45	37	42	
34	190101033039	AKASH JADON	32	40	39	35	45	
35	190101035001	MD MAHTAB ALAM	40	40	44	44	40	
36	190101035002	ARWAZ ABDIN	35	38	48	48	40	
37	190101035003	ABHIJEET PRADEEP SHINDE	38	44	42	42	40	
38	190101033038	AJIT KUMAR	34	41	37	37	34	
39	190101035010	JADHAV VAISHALI GORKSHANATH	44	45	35	35	44	
40	190101033040	PRAVEEN RAJAWAT	47	39	39	39	47	
41	190101033041	SANDEEP	40	44	40	40	40	
42	190101033042	RAJNEESH KUMAR	37	48	38	35	37	
43	190101033043	SACHIN SEN	42	42	44	40	42	
44	190101033044	AMAN SINGH	45	37	41	42	45	
45	190101033045	ANJALI PRAJAPATI	40	35	45	38	40	
46	190101033046	KAPIL	40	39	39	41	40	
47	190101033047	GAJENDRA	34	40	44	44	38	
48	190101033048	MANISH KUMAR SINGH	44	35	48	47	44	
49	190101033049	DEBASISH DOLAI	47	40	42	40	41	
50	190101033050	SURYABHAN MISHRA	40	42	37	37	40	
51	190101033051	RAJ SINGH	37	38	35	42	45	
52	190101033052	MURARI LAL	42	41	38	45	40	
53	190101033053	MANOJ KUMAR CHAUHAN	45	34	44	40	40	
54	190101033054	AMIT BOPCHE	40	44	41	40	38	
55	190101033055	VISHAL KURMI	40	48	45	34	44	
56	190101033056	NEHA PORWAL	38	42	39	44	41	
57	190101033057	NEHA SONI	44	37	44	47	45	
58	190101033058	AMIT KHATEEK	41	35	48	40	39	
59	190101033059	RAKESH KUMAR	45	39	42	37	44	
60	190101033060	SHADAB HUSSAIN	39	40	37	42	48	
61	190101033061	SUSHEEL	44	35	35	39	42	
62	190101033062	HARISH PANCHESHWAR	48	38	39	44	34	
63	190101033063	AMIT KUMAR YADAV	42	34	40	48	44	
64	190101033064	PANKAJ MEWADA	37	44	39	42	48	
65	190101033065	PANKAJ BANKHEDE	35	47	44	37	42	
66	190101033066	CHOUDHRI AMOL VILAS	39	40	48	35	37	
67	190101033067	SONALI SONKAR	40	37	42	39	35	
68	190101033068	TABISH AHMAD	35	42	37	40	39	
69	190101033069	AMIT CHOUDHURY	40	45	35	35	40	
70	190101033070	PAWAN KUMAR SHARMA	42	40	39	40	35	
71	190101033071	GANDHI JAYKUMAR	38	40	35	42	38	

		JIGNESHBHAI						
72	190101033072	SHUBHRANSHU SRIVASTAV	41	38	45	38	40	
73	190101033073	KAMAL KISHOR MISHRA	34	40	37	41	40	
74	200101035011	SONY KUMARI GUPTA	40	45	38	41	39	
75	200101035001	TANU	35	40	44	40	40	
76	200101035002	SHREYA ANURAG	38	40	41	45	35	
77	200101035003	HARSHIT RATHOR	42	34	45	40	38	
78	200101035004	BHOLA NATH BHANDARI	42	44	35	40	37	
79	200101035005	AJAY BHATUNIYA	34	47	39	38	40	
80	200101035006	SHRESTH KR MISHRA	44	40	40	36	42	
81	200101035007	NAVEEN KUMAR	35	38	39	35	40	
82	200101035010	ADITYA KUMAR KUMIL THAKUR	40	42	36	38	40	

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8TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MIDE TERM EXAM- MAX MARKS30			REMA RK
			SUBJECT CODE			
			CSA-801	CSA-802	CSA-803	
1	1801103001	AKASH SEN	24	22	19	
2	1801103002	RAINA LOVANIYA	19	24	17	
3	1801103004	AKASH	18	20	21	
4	1801103005	AJAY VERMA	20	22	17	
5	1801103007	ROSHAN PARMAR	21	18	21	
6	1801103008	NITESH RATHORE	17	19	24	
7	1801103009	MONIKA VISHWAKARMA	21	23	20	
8	1801103010	URMILA PATIDAR	20	17	22	
9	1801103011	SALMAN MANSURI	19	21	17	
10	1801103012	RAHUL SEN	15	20	21	
11	1801103014	SANJAY RATHORE	23	20	20	
12	1801103016	BASANT LODHI	20	19	19	
13	1801103017	HARSH RAKESH KUSHWAHA	20	23	19	
14	1801103019	SOHEL MANSURI	18	21	23	
15	1801103020	AKASH	19	19	21	
16	1801103021	ABHISHEK VERMA	17	18	19	
17	1801103022	RONAK GUJAR	21	20	19	
18	1801103023	GOURAV VISHWAKARMA	17	21	17	
19	1801103024	AYUSHI PARMAR	21	24	21	
20	1801103025	NAYAN PRAJAPATI	24	21	20	
21	1801103026	MANISH SINGH	20	20	19	
22	1801103027	MOHAMMAD RAZA	22	19	19	
23	1801103028	MOHSEEN ALI	23	20	23	
24	1801103029	JAYDEEP BADODIYA	23	19	21	
25	1801103030	PRINCE HEER	21	19	19	
26	1801103031	VARISHA KHANAM	15	23	18	
27	1801103032	IVON CLARENCE	18	21	24	
28	1801103033	MANISH SINGH	20	19	20	
29	1801103034	SAURAV SINGH RATHORE	21	19	22	
30	1801103036	SHUBHAM SISODIA	17	18	23	
31	1801103037	ARTI VERMA	21	20	17	

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32	1801103038	HRITIK RATHORE	20	23	21	
33	1801103039	MEGHA JAT	24	20	20	
34	1801103040	SOHAN SINGH VERMA	20	20	20	
35	1801103041	SUBHAM SANGATE	22	18	22	
36	1801103042	RAHUL KUSHWAHA	17	19	24	
37	1801103043	BURLA UTTEJ	21	17	20	
38	1801103044	HAZMA IQBALZARIWALA	20	21	17	
39	1801103045	DEBI PRASAD DUTTA	19	20	21	
40	1801103046	PARTH TANEJA	23	19	20	
41	1801103047	RACHABATTUNI SRI RATIN	16	19	20	
42	1801103048	SANADULA MADHAVAN	21	23	19	
43	1801103049	CHITTANOORI MANISH	24	21	23	
44	1801103050	PULUSU SHANMUKA LAXMA REDDY	20	19	17	
45	1801103053	NAVDEEP SINGH	22	18	21	
46	1801103054	VICKY KUMAR	23	23	24	
47	1801103061	KIRTI SONI	25	21	20	
48	1801103062	SHAJID KHAN	21	19	22	
49	1801103063	MANOJ MEWADA	19	18	23	
50	1801103064	MONIKA VERMA	18	20	23	
51	1801103065	ANKIT JOSHI	22	21	21	
52	1801103066	UTTAM KARSH	22	21	19	
53	1801103067	JITENDRA KUMAR	20	20	19	
54	1801103068	ROHIT VERMA	22	20	23	
55	1801103069	AKHILESH MALVIYA	24	22	17	
56	1801103070	SHIKHA PRAJAPATI	20	24	21	
57	1801103071	UMESH MECHAN	24	20	24	
58	1801103072	AKHILESH GOUR	20	22	21	
59	1801103073	RENU PARMAR	22	18	20	
60	1801103074	SWATEE MEWADA	18	19	19	
61	1801103075	DINESH BIRLA	19	22	19	
62	1801103076	SHIVANI	23	24	23	
63	1801103077	GULSHAN PATIDAR	17	20	21	
64	1801103078	GYAN SINGH PARMAR	21	22	18	
65	1801103079	SANJEET JATAV	24	18	22	
66	1801103080	SURESH KATARA	21	19	20	
67	1801103081	ABHISHEK SHARMA	20	23	20	
68	1801103082	ASHOK PRAJAPATI	21	21	21	
69	1801103083	KIRAN RATHORE	20	17	20	
70	1801103084	DEEPAK PRAJAPATI	22	22	22	
71	1801103085	DEVENDRA MEWADA	20	24	22	
72	1801103086	KUMER SINGH KUSHWAH	22	20	23	

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73	1801103087	BHAVNA THAKUR	22	22	17	
74	1801103088	DEEPIKA RATHORE	15	18	21	
75	1801103089	SHASHANK SHRAOTRIYA	17	19	24	
76	1801103090	SOHAN GUTHA	23	22	20	
77	1801103091	BALWANT KOSE	17	24	22	
78	1801103092	VIDHAYA DHAKAD	22	20	23	
79	190101035001	MD MAHTAB ALAM	24	24	23	
80	190101035002	ARWAZ ABDIN	20	22	21	
81	190101035003	ABHIJEET PRADEEP SHINDE	22	20	19	

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S.NO.	ENROLLEMENT NUMBER	NAME OF STUDENTS	PUT EXAM- MAX MARKS 60			REMARK
			SUBJECT CODE			
			CSA-801	CSA 802	CSA 803	
1	1801103001	AKASH SEN	40	48	38	
2	1801103002	RAINA LOVANIYA	35	42	34	
3	1801103004	AKASH	38	37	44	
4	1801103005	AJAY VERMA	34	35	47	
5	1801103007	ROSHAN PARMAR	44	39	44	
6	1801103008	NITESH RATHORE	47	40	48	
7	1801103009	MONIKA VISHWAKARMA	40	39	42	
8	1801103010	URMILA PATIDAR	37	44	37	
9	1801103011	SALMAN MANSURI	42	40	35	
10	1801103012	RAHUL SEN	35	38	39	
11	1801103014	SANJAY RATHORE	39	44	40	
12	1801103016	BASANT LODHI	40	41	35	
13	1801103017	HARSH RAKESH KUSHWAHA	35	45	38	
14	1801103019	SOHEL MANSURI	38	39	42	
15	1801103020	AKASH	34	44	38	
16	1801103021	ABHISHEK VERMA	44	48	41	
17	1801103022	RONAK GUJAR	47	42	34	
18	1801103023	GOURAV VISHWAKARMA	44	34	44	
19	1801103024	AYUSHI PARMAR	48	40	48	
20	1801103025	NAYAN PRAJAPATI	42	35	42	
21	1801103026	MANISH SINGH	37	41	37	
22	1801103027	MOHAMMAD RAZA	35	45	35	
23	1801103028	MOHSEEN ALI	39	39	39	
24	1801103029	JAYDEEP BADODIYA	40	44	40	
25	1801103030	PRINCE HEER	35	48	35	
26	1801103031	VARISHA KHANAM	38	42	38	
27	1801103032	IVON CLARENCE	37	39	34	
28	1801103033	MANISH SINGH	42	40	44	
29	1801103034	SAURAV SINGH RATHORE	45	35	47	

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30	1801103036	SHUBHAM SISODIA	40	38	40	
31	1801103037	ARTI VERMA	40	34	37	
32	1801103038	HRITIK RATHORE	45	44	42	
33	1801103039	MEGHA JAT	40	47	35	
34	1801103040	SOHAN SINGH VERMA	40	40	39	
35	1801103041	SUBHAM SANGATE	34	37	44	
36	1801103042	RAHUL KUSHWAHA	44	42	48	
37	1801103043	BURLA UTTEJ	47	45	42	
38	1801103044	HAZMA IQBALZARIWALA	40	40	37	
39	1801103045	DEBI PRASAD DUTTA	37	40	35	
40	1801103046	PARTH TANEJA	42	34	39	
41	1801103047	RACHABATTUNI SRI RATIN	45	44	40	
42	1801103048	SANADULA MADHAVAN	40	47	38	
43	1801103049	CHITTANOORI MANISH	40	40	40	
44	1801103050	PULUSU SHANMUKA LAXMA REDDY	45	37	40	
45	1801103053	NAVDEEP SINGH	40	35	38	
46	1801103054	VICKY KUMAR	40	39	44	
47	1801103061	KIRTI SONI	34	40	41	
48	1801103062	SHAJID KHAN	44	35	40	
49	1801103063	MANOJ MEWADA	47	40	45	
50	1801103064	MONIKA VERMA	40	42	40	
51	1801103065	ANKIT JOSHI	37	42	40	
52	1801103066	UTTAM KARSH	42	45	38	
53	1801103067	JITENDRA KUMAR	45	40	44	
54	1801103068	ROHIT VERMA	40	40	41	
55	1801103069	AKHILESH MALVIYA	38	40	45	
56	1801103070	SHIKHA PRAJAPATI	44	34	39	
57	1801103071	UMESH MECHAN	41	44	44	
58	1801103072	AKHILESH GOUR	45	47	48	
59	1801103073	RENU PARMAR	39	40	42	
60	1801103074	SWATEE MEWADA	44	37	37	
61	1801103075	DINESH BIRLA	40	42	35	
62	1801103076	SHIVANI	48	45	39	
63	1801103077	GULSHAN PATIDAR	37	40	40	
64	1801103078	GYAN SINGH PARMAR	35	40	39	
65	1801103079	SANJEET JATAV	39	38	44	
66	1801103080	SURESH KATARA	40	44	48	
67	1801103081	ABHISHEK SHARMA	39	37	42	
68	1801103082	ASHOK PRAJAPATI	44	42	37	
69	1801103083	KIRAN RATHORE	40	40	35	
70	1801103084	DEEPAK PRAJAPATI	38	37	39	
71	1801103085	DEVENDRA MEWADA	44	42	35	

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72	1801103086	KUMER SINGH KUSHWAH	41	39	45	
73	1801103087	BHAVNA THAKUR	45	44	37	
74	1801103088	DEEPIKA RATHORE	39	48	47	
75	1801103089	SHASHANK SHRAOTRIYA	44	42	40	
76	1801103090	SOHAN GUTHA	48	37	40	
77	1801103091	BALWANT KOSE	42	35	42	
78	1801103092	VIDHAYA DHAKAD	34	39	45	
79	190101035001	MD MAHTAB ALAM	40	36	42	
80	190101035002	ARWAZ ABDIN	35	38	34	
81	190101035003	ABHIJEET PRADEEP SHINDE	37	40	44	

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4TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MIDE TERM EXAM- MAX MARKS 30					REMARK
			SUBJECT CODE					
			CSA-401	CSA-402	CSA-403	CSA-404	CSA-405	
1	200101033001	NEHA MEWADA	23	21	22	23	23	
2	200101033002	SIKHA MEWADA	17	20	24	21	23	
3	200101033003	PALAK THAKUR	25	24	20	19	21	
4	200101033004	MUSKAN RATHORE	20	19	22	18	19	
5	200101033005	ARYAN VERMA	20	23	18	20	18	
6	200101033006	ABHISHEK KUMAR	22	21	19	21	20	
7	200101033007	VISHAL THAKUR	24	19	22	17	21	
8	200101033008	SWATI SHARMA	20	25	24	21	17	
9	200101033009	ABHISHEK TAMOLIYA	15	20	20	20	21	
10	200101033010	PRASHANT KUSHWAHA	21	21	22	20	20	
11	200101033011	ANIL PANCHAL	20	17	18	20	24	
12	200101033013	JAIPRAKASH AHIRWAR	20	21	19	18	20	
13	200101033014	ADESH KHAJURIYA	22	20	23	19	22	
14	200101033015	RAJAN SHARMA	24	20	17	17	17	
15	200101033016	SWASTIK SHARMA	20	20	21	21	21	
16	200101033017	SAMEER KHAN	22	18	24	20	20	
17	200101033018	SACHIN CHANDRAVANSHI	18	19	21	19	19	
18	200101033019	ROMESH SINGH NARWARIYA	19	17	20	19	19	
19	200101033020	MONIKA	22	21	20	23	23	
20	200101033021	ADITYA AGRAWAL	24	20	22	17	21	
21	200101033022	YASH TANEJA	15	19	21	22	18	
22	200101033023	SIDDHARTH SAGAR	22	19	20	24	22	
23	200101033024	KESHAV KUMAR SHUKLA	18	23	19	20	20	
24	200101033025	VINAY YADAV	19	17	19	22	20	
25	200101033026	AAYUSH LILHORE	23	21	23	18	21	
26	200101033027	GUDDOO PASWAN	17	20	21	19	20	
27	200101033028	PRANAY NEVE	21	21	19	22	22	

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28	200101033029	YASHOVARDHAN SAHU	24	17	18	24	20	
29	200101033030	RAKHI VISHWAKARMA	21	21	20	20	22	
30	200101033031	GIRISH MOURYA	20	20	22	24	22	
31	210101035001	ANSHU KUMAR CHOUBEY	16	19	20	22	18	
32	210101035002	ANIMESH RATHORE	22	16	18	20	17	
33	210101035003	MAHALE MAHENDRAKUMAR RAJENDRA	21	20	21	17	21	
34	210101035004	GIRASE KALPESH MAHENDRASING	19	22	24	21	19	
35	210101035005	PATIL VIKRANT DAGAJI	18	17	21	20	18	
36	210101035006	PATIL DIPAK SUBHASH	20	21	20	19	20	
37	210101035007	KRITIK HEDAU	21	20	23	19	21	
38	210101035008	SUMANT VIJAY VAISHNAV	17	19	21	23	17	
39	210101035009	THAKUR YASH JOGENDRASINGH	21	19	18	21	21	
40	210101035010	KHARCHE VISHAL BALIRAM	20	23	22	18	20	
41	210101035011	JITENDRA SINGH KHARAT	20	21	18	17	19	

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4TH SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS 60					REMARK
			SUBJECT CODE					
			CSA-401	CSA-402	CSA-403	CSA-404	CSA-405	
1	200101033001	NEHA MEWADA	37	48	38	35	37	
2	200101033002	SIKHA MEWADA	42	42	44	40	42	
3	200101033003	PALAK THAKUR	45	37	41	42	45	
4	200101033004	MUSKAN RATHORE	40	35	45	38	40	
5	200101033005	ARYAN VERMA	40	39	39	41	40	
6	200101033006	ABHISHEK KUMAR	34	40	44	44	38	
7	200101033007	VISHAL THAKUR	44	35	40	47	44	
8	200101033008	SWATI SHARMA	48	40	42	40	41	
9	200101033009	ABHISHEK TAMOLIYA	40	42	37	37	40	
10	200101033010	PRASHANT KUSHWAHA	30	38	35	42	45	
11	200101033011	ANIL PANCHAL	42	41	38	45	40	
12	200101033013	JAIPRAKASH AHIRWAR	45	34	44	40	40	
13	200101033014	ADESH KHAJURIYA	40	32	41	40	38	
14	200101033015	RAJAN SHARMA	40	48	45	34	44	
15	200101033016	SWASTIK SHARMA	38	42	39	44	41	
16	200101033017	SAMEER KHAN	44	37	44	47	45	
17	200101033018	SACHIN CHANDRAVANSHI	41	35	48	40	39	
18	200101033019	ROMESH SINGH NARWARIYA	45	39	42	37	44	
19	200101033020	MONIKA	39	40	37	42	48	
20	200101033021	ADITYA AGRAWAL	44	35	35	39	42	
21	200101033022	YASH TANEJA	48	38	39	44	34	
22	200101033023	SIDDHARTH SAGAR	42	34	40	48	44	
23	200101033024	KESHAV KUMAR SHUKLA	37	44	39	42	48	
24	200101033025	VINAY YADAV	35	47	44	37	42	
25	200101033026	AAYUSH LILHORE	39	40	48	35	37	

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26	200101033027	GUDDOO PASWAN	40	37	42	39	35	
27	200101033028	PRANAY NEVE	35	42	37	40	39	
28	200101033029	YASHOVARDHAN SAHU	40	45	35	35	40	
29	200101033030	RAKHI VISHWAKARMA	30	40	39	40	35	
30	200101033031	GIRISH MOURYA	38	40	35	42	38	
31	210101035001	ANSHU KUMAR CHOUBEY	41	38	45	38	40	
32	210101035002	ANIMESH RATHORE	34	40	37	41	40	
33	210101035003	MAHALE MAHENDRAKUMAR RAJENDRA	40	45	38	41	39	
34	210101035004	GIRASE KALPESH MAHENDRASING	35	40	44	40	40	
35	210101035005	PATIL VIKRANT DAGAJI	38	40	41	45	35	
36	210101035006	PATIL DIPAK SUBHASH	42	34	45	40	38	
37	210101035007	KRITIK HEDAU	42	44	35	40	37	
38	210101035008	SUMANT VIJAY VAISHNAV	30	47	39	38	40	
39	210101035009	THAKUR YASH JOGENDRASINGH	44	40	40	36	42	
40	210101035010	KHARCHE VISHAL BALIRAM	35	38	39	35	40	
41	210101035011	JITENDRA SINGH KHARAT	40	42	36	38	40	

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6TH SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS 60					REMARK
			SUBJECT CODE					
			ITA-601	ITA-602	ITA-603	ITAA-604	ITA-605	
1	190101043001	MUBASHIRA AHMED	39	40	37	42	48	
2	190101043002	MUKUND PATEL	44	35	35	39	42	
3	190101043003	SAMEER KHAN	48	38	39	44	34	
4	190101043004	RAMAYAN	42	34	40	48	44	
5	190101043005	RANJANA MEWADA	30	44	39	42	45	
6	190101043006	AKASH ASTAYA	35	47	44	37	42	
7	190101043007	RACHNA SINGADIYA	39	40	48	35	37	
8	190101043008	AFAK BEG	40	37	42	39	35	
9	190101043009	SHAKIB RAIEN	35	42	37	40	39	
10	190101043010	MOHIT KUMAR GOUR	40	45	35	35	40	
11	190101043011	ALIYA HUSAIN	48	40	39	40	35	
12	190101043012	ANKIT SILORIYA	38	40	35	42	38	
13	190101043013	PRAGYA PARMAR	41	38	45	38	40	
14	190101043014	TALIB KHAN	34	40	37	41	40	
15	190101043015	RAVISHANKAR GURJAR	40	45	38	41	39	
16	190101043016	BHARAT GOUR	30	40	44	40	40	
17	190101043017	KEVAL KUMAR CHATURVEDI	38	40	41	45	35	
18	190101043018	MAHESH KUMAR	42	34	45	40	38	

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6TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MID TERM EXAM- MAX MARKS 30					REMARK
			SUBJECT CODE					
			ITA-601	ITA-602	ITA-603	ITAA-604	ITA-605	
1	190101043001	MUBASHIRA AHMED	20	23	18	20	18	
2	190101043002	MUKUND PATEL	22	21	19	21	20	
3	190101043003	SAMEER KHAN	24	19	22	17	21	
4	190101043004	RAMAYAN	20	18	24	21	17	
5	190101043005	RANJANA MEWADA	15	20	20	20	21	
6	190101043006	AKASH ASTAYA	21	21	22	20	20	
7	190101043007	RACHNA SINGADIYA	24	17	18	20	24	
8	190101043008	AFAK BEG	20	21	19	18	20	
9	190101043009	SHAKIB RAIEN	22	20	23	19	22	
10	190101043010	MOHIT KUMAR GOUR	24	20	17	17	17	
11	190101043011	ALIYA HUSAIN	20	20	21	21	21	
12	190101043012	ANKIT SILORIYA	22	18	24	20	20	
13	190101043013	PRAGYA PARMAR	20	19	21	22	18	
14	190101043014	TALIB KHAN	22	19	20	24	22	
15	190101043015	RAVISHANKAR GURJAR	16	23	19	20	20	
16	190101043016	BHARAT GOUR	19	17	19	22	20	
17	190101043017	KEVAL KUMAR CHATURVEDI	23	21	23	18	21	
18	190101043018	MAHESH KUMAR	17	20	21	19	20	

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8TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MIDE TERM EXAM- MAX MARKS30			REMARK
			SUBJECT CODE			
			ITA-801	ITA-802	ITA-803	
1	1801104001	KUNAL SANJAY PATIL	21	19	22	
2	1801104002	BRAJESH MEWADA	19	18	23	
3	1801104003	MANSHI NAMDEV	18	20	23	
4	1801104004	SUNNY NAMDEV	22	21	21	
5	1801104005	SUSHEEL KUMAR VERMA	22	21	19	
6	1801104006	SIDHARTH MEWADA	16	20	19	
7	1801104007	GAJRAJ	22	20	23	
8	1801104008	RAVI VISHWAKARMA	24	22	17	
9	1801104009	SHYAM PATIDAR	20	24	21	
10	1801104010	SONU LOVEVANSHI	24	20	24	
11	1801104011	OMPRAKASH BERAGI	20	22	21	
12	1801104012	NIKHIL SAMBARE	22	18	20	
13	1801104013	RAVI	18	19	19	
14	1801104014	MAHENDRA	19	22	19	
15	1801104015	LOKENDRA MEWADA	23	24	23	
16	1801104016	SUDHIR RAHANGDALE	17	20	21	
17	1801104017	KAMLESH	21	22	18	
18	1801104018	RAMPHOOL LOVEWANSHI	24	18	22	
19	1801104019	TEKRAM PATEL	21	19	20	
20	1801104020	KULDEEP JAT	20	23	20	
21	1801104021	PRASANNA DAMOR	20	20	19	
22	1801104022	PRADEEP KUMAR VASUNIYA	22	19	19	
23	1801104023	ANKIT VERMA	23	20	23	

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8TH SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS-60			REMARK
			SUBJECT CODE			
			ITA-801	ITA-802	ITA-803	
1	1801104001	KUNAL SANJAY PATIL	39	55	51	
2	1801104002	BRAJESH MEWADA	40	47	47	
3	1801104003	MANSHI NAMDEV	38	46	45	
4	1801104004	SUNNY NAMDEV	48	51	39	
5	1801104005	SUSHEEL KUMAR VERMA	40	47	40	
6	1801104006	SIDHARTH MEWADA	32	35	38	
7	1801104007	GAJRAJ	46	50	48	
8	1801104008	RAVI VISHWAKARMA	45	53	40	
9	1801104009	SHYAM PATIDAR	40	47	50	
10	1801104010	SONU LOVEVANSHI	42	42	46	
11	1801104011	OMPRAKASH BERAGI	55	44	45	
12	1801104012	NIKHIL SAMBARE	47	52	47	
13	1801104013	RAVI	46	42	42	
14	1801104014	MAHENDRA	51	55	44	
15	1801104015	LOKENDRA MEWADA	47	47	46	
16	1801104016	SUDHIR RAHANGDALE	45	41	51	
17	1801104017	KAMLESH	50	45	47	
18	1801104018	RAMPHOOL LOVEWANSHI	32	38	47	
19	1801104019	TEKRAM PATEL	51	48	42	
20	1801104020	KULDEEP JAT	47	40	44	
21	1801104021	PRASANNA DAMOR	35	50	52	
22	1801104022	PRADEEP KUMAR VASUNIYA	50	46	53	
23	1801104023	ANKIT VERMA	53	45	47	

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2ND SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS 70					REMARK
			SUBJECT CODE					
			MCA-2201	MCA-2202	MCA-2203	MCA-2204	MCA-2205	
1	**210103016001**	MD KARIM UDDIN	52	39	45	40	55	
2	**210103016002**	HEMANT PARMAR	47	40	40	44	45	
3	**210103016003**	DALIKA SHARMA	42	48	44	45	55	
4	**210103016004**	NAVRATNA KUMAR	45	40	45	50	48	
5	**210103016005**	RAHUL JAIN	48	42	50	53	45	
6	**210103016006**	NAL KUMAR PANDIT	44	48	53	47	50	
7	**210103016007**	DINESH KEWAT	44	45	47	42	50	
8	**210103016008**	ANKIT ABHISHEK SRIVASTAVA	40	38	42	38	41	
9	**210103016009**	PRATIKSHA	30	48	44	52	50	
10	**210103016010**	SHIRDDHA VAISHNAV	48	40	52	45	45	
11	**210103016011**	MANNU	50	50	46	48	40	
12	**210103016012**	MANAV LAKHANPAL	32	46	42	51	40	
13	**210103016013**	CHANDRAGOPAL	40	45	41	44	38	
14	**210103016014**	AJAY RATHORE	32	40	45	40	44	
15	**210103016015**	KARTIK SHAH	40	44	39	45	41	
16	**210103016016**	SHIKHA MISHRA	38	45	58	48	45	
17	**210103016017**	PRAVEEN PARIHAR	42	50	48	50	39	
18	**210103016018**	KUNDAN KUMAR	48	53	40	38	44	
19	**210103016019**	MOHAMMAD ANAS ANSARI	42	47	42	35	48	
20	**210103016020**	ARPAN PATHAK	37	42	55	40	42	
21	**210103016021**	SUMIT KUMAR VERMA	35	44	47	42	34	
22	**210103016022**	AMIT	39	52	46	48	44	
23	**210103016023**	AYUSH DUWEY	40	46	51	45	48	
24	**210103016024**	DEEPESH YADAV	35	42	47	51	42	

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2^{ND} SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MID TERM EXAM- MAX MARKS 20					REMARK
			SUBJECT CODE					
			MCA-2201	MCA-2202	MCA-2203	MCA-2204	MCA-2205	
1	210103016001	MD KARIM UDDIN	15	12	12	13	14	
2	210103016002	HEMANT PARMAR	12	12	11	10	15	
3	210103016003	DALIKA SHARMA	14	16	14	13	13	
4	210103016004	NAVRATNA KUMAR	16	14	15	11	10	
5	210103016005	RAHUL JAIN	9	15	13	14	15	
6	210103016006	NAL KUMAR PANDIT	10	13	10	15	12	
7	210103016007	DINESH KEWAT	13	10	13	13	16	
8	210103016008	ANKIT ABHISHEK SRIVASTAVA	15	13	11	10	13	
9	210103016009	PRATIKSHA	14	11	16	15	10	
10	210103016010	SHIRDDHA VAISHNAV	12	14	15	12	13	
11	210103016011	MANNU	12	15	13	15	15	
12	210103016012	MANAV LAKHANPAL	9	13	10	13	14	
13	210103016013	CHANDRAGOPAL	14	10	15	10	12	
14	210103016014	AJAY RATHORE	15	14	12	13	10	
15	210103016015	KARTIK SHAH	13	16	14	11	14	
16	210103016016	SHIKHA MISHRA	10	13	16	14	16	
17	210103016017	PRAVEEN PARIHAR	13	10	13	15	13	
18	210103016018	KUNDAN KUMAR	15	14	10	13	10	
19	210103016019	MOHAMMAD ANAS ANSARI	14	15	14	10	14	
20	210103016020	ARPAN PATHAK	15	13	15	13	14	
21	210103016021	SUMIT KUMAR VERMA	14	10	13	11	15	
22	210103016022	AMIT	12	13	10	12	13	
23	210103016023	AYUSH DUWEY	12	10	13	11	10	
24	210103016024	DEEPESH YADAV	11	14	12	14	15	

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4TH SEMESTER STUDENTS'S MID TERM EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	MID TERM EXAM- MAX MARKS 20			REMARK
			SUBJECT CODE			
			MCA-2401	MCA-2402	MCA-2403	
1	200103016001	MANISH KUMAR VERMA	14	10	10	
2	200103016002	AKANKSHA KUMARI	15	14	13	
3	200103016003	BHAWNA KUMARI	13	15	11	
4	200103016004	PRITI KUMARI	9	13	14	
5	200103016005	ARTI KUMARI	15	13	15	
6	200103016006	RAJKUMAR	12	10	12	
7	200103016007	SHANKAR KUMAR	14	13	12	
8	200103016008	ATUL SHARMA	16	11	11	
9	200103016009	NEHA GUPTA	16	14	14	
10	200103016010	DEEPAK KUMAR GANDHI	10	16	15	
11	200103016011	AVISHEK ANAND	14	12	13	
12	200103016012	JITENDRA VISHWAKARMA	15	12	10	
13	200103016013	ANURAG TRIPATHI	13	11	13	
14	200103016014	PRATIGYA RUCHI	13	16	11	
15	200103016015	SOURAV KUMAR	10	16	15	
16	200103016016	VIJAY THAKUR	13	13	12	
17	200103016017	KESHAV PATIDAR	11	14	15	
18	200103016018	ROSHAN KUMAR	14	15	12	
19	200103016019	SAURABH KUMAR	15	13	14	
20	200103016020	NUTAN SRIVASTAVA	10	10	16	
21	200103016021	RAVINA KUMARI	12	15	13	
22	200103016022	BABUL HODA	11	12	10	
23	200103016023	ABHISHEK RAIKWAR	14	14	12	
24	200103016024	ABHISHEK KUMAR	15	16	11	
25	200103016025	ROSHAN KUMAR RANJAN	13	13	14	
26	200103016026	OM SHANKAR KUMAR	10	10	13	
27	200103016027	ANKIT ANAND	13	12	10	
28	200103016028	JAIDEEP SINGH THAKUR	11	11	15	
29	200103016029	ASHISH KUMAR	15	14	12	
30	200103016030	YASHASHWEE JAMAIYAR	12	15	14	
31	200103016031	RAMCHANDRA KUMAR	14	13	16	
32	200103016032	RAVI PRAKASH	16	10	13	

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33	200103016033	RAVI KUMAR	13	13	10	
34	200103016034	RAHUL KUMAR	10	11	14	
35	200103016035	DILBAR ANAND	14	14	15	
36	200103016036	ANKIT MEWADA	15	14	15	
37	200103016037	DEVENDRA MEWADA	13	16	12	
38	200103016039	RAVI TEJA M	10	13	14	
39	200103016040	ANANYA PATHAK	13	14	12	

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4TH SEMESTER STUDENTS'S PUT EXAM RESULT

S.NO.	ENROLLEMENT NUMBER	STUDENT NUMBER	PUT EXAM- MAX MARKS 70			REMA RK
			SUBJECT CODE			
			MCA-2401	MCA-2402	MCA-2403	
1	200103016001	MANISH KUMAR VERMA	45	44	39	
2	200103016002	AKANKSHA KUMARI	55	52	40	
3	200103016003	BHAWNA KUMARI	40	46	38	
4	200103016004	PRITI KUMARI	48	42	48	
5	200103016005	ARTI KUMARI	40	41	40	
6	200103016006	RAJKUMAR	42	45	50	
7	200103016007	SHANKAR KUMAR	55	39	46	
8	200103016008	ATUL SHARMA	47	40	45	
9	200103016009	NEHA GUPTA	32	38	47	
10	200103016010	DEEPAK KUMAR GANDHI	51	48	42	
11	200103016011	AVISHEK ANAND	47	40	44	
12	200103016012	JITENDRA VISHWAKARMA	35	50	52	
13	200103016013	ANURAG TRIPATHI	50	46	53	
14	200103016014	PRATIGYA RUCHI	53	45	47	
15	200103016015	SOURAV KUMAR	47	47	42	
16	200103016016	VIJAY THAKUR	42	42	44	
17	200103016017	KESHAV PATIDAR	44	44	52	
18	200103016018	ROSHAN KUMAR	52	52	46	
19	200103016019	SAURABH KUMAR	46	46	42	
20	200103016020	NUTAN SRIVASTAVA	42	42	41	
21	200103016021	RAVINA KUMARI	41	44	45	
22	200103016022	BABUL HODA	45	42	46	
23	200103016023	ABHISHEK RAIKWAR	39	55	51	
24	200103016024	ABHISHEK KUMAR	40	47	47	
25	200103016025	ROSHAN KUMAR RANJAN	38	46	45	
26	200103016026	OM SHANKAR KUMAR	48	51	39	
27	200103016027	ANKIT ANAND	30	47	40	
28	200103016028	JAIDEEP SINGH THAKUR	50	35	38	
29	200103016029	ASHISH KUMAR	46	50	48	
30	200103016030	YASHASHWEE JAMAIYAR	45	53	40	
31	200103016031	RAMCHANDRA KUMAR	40	47	50	
32	200103016032	RAVI PRAKASH	42	42	46	

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33	200103016033	RAVI KUMAR	55	44	45	
34	200103016034	RAHUL KUMAR	47	52	47	
35	200103016035	DILBAR ANAND	46	42	42	
36	200103016036	ANKIT MEWADA	51	55	44	
37	200103016037	DEVENDRA MEWADA	47	47	46	
38	200103016039	RAVI TEJA M	45	41	51	
39	200103016040	ANANYA PATHAK	50	45	47	

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Department of Computer Science & Engineering
Subject:Energy,Ecology Environment & Society(BEA-401)

Assignment

Q.1 What are fossil fuels?Explain.
Q.2 Differentiate between renewable and non-renewable sources of energy.
Q.3 What is noise pollution?Explain the adverse effect of noise pollution.
Q.4 Explain various methods of disposal of waste management along with their merits and demerits.
Q.5 Explain different segments of environment with diagram.

Tutorial

Q.1 Define water pollution.Classify and discuss in brief various types of water pollutants.
Q.2 Explain soil erosion with diagram.
Q.3 What is waste management.Name and discuss the three basic functional management of waste management.
Q.4 What are the major components that contains toxic materials in electronic waste.
Q.5 Explain acid rain with diagram.

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Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

Department of Computer Science & Engineering
Subject:Software Engineering(CSA-403)

Assignment

Q.1 Differentiate between function-oriented and object-oriented software development.

Q.2 Describe different software prototype techniques.

Q.3 Explain software test process. Differentiate between black-box and white-box testing.

Q.4 Explain Software Quality Assurance(SQA) in detail.

Q.5 List and explain the steps in risk management process.

Tutorial

Q.1 Explain various design concepts to be considered during design process.

Q.2 What do you mean by system testing.Explain in detail.

Q.3 Evaluate Boundary value analysis with diagram.

Q.4 Discuss briefly on software maintenance activities.

Q.5 Explain the use case diagram of ATM machine with neat diagram.

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

Department of Computer Science & Engineering
Subject:Computer Organization And Architecture(CSA-404)

Assignment

Q.1 Explain different page replacement methods.

Q.2 What is cache memory?Expalin the following:

(i) Hit ratio

(ii) Average access time

Q.3 Evaluate PCI bus and SCSI bus with diagram.

Q.4 Explain Booths Algorithm in detail.

Q.5 Differentiate between asynchronous and synchronous modes of transfer.

Tutorial

Q.1 What are registers? Explain general purpose and special purpose registers.

Q.2 Explain DMA with its different modes.

Q.3 Evaluate various techniques of cache mapping.

Q.4 What is the use of pipelining in multiprocessors? Explain.

Q.5 Differentiate between array processing and vector processing.

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

Department of Computer Science & Engineering
Subject:Operating Systems (CSA-405)

Assignment

Q.1 What is deadlock? Explain necessary conditions for deadlock to occur.

Q.2 Define disk scheduling. Explain different disk scheduling algorithms.

Q.3 What is virtual memory? Explain the concept of demand paging.

Q.4 Explain critical section problem with the solution.

Q.5 Evaluate different disk allocation methods with example.

Tutorial

Q.1 What are semaphores? Explain its different types.

Q.2 What are system calls?Explain different types of system calls provided by the operating system.

Q.3 Define CPU scheduling.Explain different types of CPU scheduling algorithms.

Q.4 Write short note on :

(i) Inter-process communication

(ii) Multithreading

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Computer Science & Engineering

Subject-Compiler Design(CSA-601)

<u>Assignment</u>

Q.1 Describe the various data structures used in Compilers.

Q.2 Explain in detail the various phases of compiler with an example.

Q.3 Explain the various errors encountered in different phases of Compiler

Q.4 Check whether the given grammar is LL(1) or not

$S \rightarrow iEt\ SS' \ /\ a \quad S' \rightarrow eS\ /\ E \quad E \rightarrow b$

Q.5 Describe Peephole optimization briefly. Also explain Backpatching.

<u>Tutorial</u>

Q.1 Distinguish between top-down passing and bottom-up parsing? What is the largest class of grammars that can be parsed by each of them?

Q.2 What do you mean by LEX? Explain in detail.

Q.3 Prove that Grammar is CLR but not LALR

$S \rightarrow Aa\ /\ bAc\ /\ Bc\ /\ bBa$

$A \rightarrow d$

$B \rightarrow d$

Q.4 How does an Operator Precedence work? Use a pre-constructed operator precedence table to guide the parsing of an input ‘a+b–20’ using operator precedence parser.

Q.5 Construct DAG for the following expression :

$a + a * (b – c) + (b – c) * d$

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Computer Science & Engineering

Subject-Compiler Design(CSA-601)

Assignment

Q.1 Give explanation of different type of topologies in terms of its advantages and disadvantages.

Q.2 What do you mean by CSMA method of MAC? Define persistent and non persistent CSMA.

Q.3 Describe the use of IPConfig and Ping and write its commands.

Q.4 What do you mean by internet working devices? Write the name of different kind internet working devices and explain any two in brief.

Q.5 Write short notes on any two of the followings:

a) Wireless LAN

b) Congestion control

c) FDDI wireless LAN

d) Arpanet

Tutorial

Q.1 What is the difference between unicast and multicast routing protocols? Give suitable examples for them.

Q.2 Draw the TCP/IP reference model with stack diagram and discuss the function of each layer in detail.

Q.3 With the help of any example compare Circuit Switching, message switching and Packet Switching?

Q.4 What do you mean by error detection? Write down the name of methods. An 8-bit with binary value 10101111 is to be encoded using an even-parity Hamming code. What is the binary value after encoding?

Q.4 What is Pure ALOHA and slotted ALOHA? How the efficiency of slotted ALOHA is twice that of pure ALOHA? Derive it.

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Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Computer Science & Engineering

Subject- Advance Computer Architecture (CSA-603(A))

Assignment

Q.1 What is cache coherence protocol?Explain

Q.2 Draw and explain block diagram of Back plane Bus system.

Q.3 Explain store and forward routing with diagram.

Q.4 Describe inclusion property and memory coherence requirements.

Q.5 Differentiate between RISC & CISC scalar processors.

Tutorial

Q.1 Explain the basic VLIW approach for exploiting ILP, using multiple access.

Q.2 Define the computer architecture. Explain Flynn's classification with the help of diagram.

Q.3 Give a brief note of vector super computer.

Q.4 Explain pipeling.What are the major hurdles of pipelining.

Q.5 Write Short note on:

(i) Parallel programming environment

(ii) Tomasulo's Algorithm

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Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Computer Science & Engineering

Subject: Soft Computing (CSA-604(B))

Assignment

Q.1 Define the following:

i) Artificial Intelligence

ii) Soft Computing

Q.2 What is soft computing? Compare soft computing with hard computing.

Q.3 What do you mean by Production system? What are various types of production system? Write down its characteristics.

Q.4 Write short notes:(Any two) a) Crossover b) Mutation operator c) Reproduction phase of genetic algorithm d) Fuzzy membership function

Q.5 Define the architecture of a perceptron? What do you mean by linear separability?

Tutorial

Q.1 State the difference between supervised learning and unsupervised learning.

Q.2 Explain the architecture and algorithm of Counter Propagation Network with diagram.

Q.3 Explain the following term:

i) Convolutional Neural Network

ii) Fuzzy Inference System

iii) Adaline / Madaline

Q.4 Explain Kohonen SoM Network.

Q.5 Discuss Ant colony optimization methods.

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Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Computer Science & Engineering

Subject: Cyber Law & Ethics (CSA-605(B))

Assignment

Q.1 Explain Freedom of speech and expression in Cyberspace.

Q.2 Define contract and online contract. Discuss the various types of online contracts and required term and conditions.

Q.3 Discuss International Law and Jurisdictional issues in cyberspace

Q.4 What is Cyberstalking? Explain with the help of case laws.

Q.5 Explain following term. i) Cyber Jurisprudence ii) Domain Names related issues iii) Web Technology

Tutorial

Q.1 State the role of law in cyber world and discuss how the issues relating to Jurisdiction, Applicable laws and Enforcement issues are decided in private international laws with the help of appropriate case laws?

Q.2 Discuss different types of civil wrongs under the IT Act 2000.

Q.3 Explain Dispute resolution in cyberspace.

Q.4 Explain Digital Forgery and Right to Data protection?

Q.5 Write short notes (any three)

a) E-commerce salient features

b) Identity theft and fraud

c) Cyber-Torts

d) B2C and C2C

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Computer Science & Engineering
Subject: Web Engineering (CSA-801)

Assignment

Q.1 What is search engine? What are the main principles used by a search engine to retrieve information from the web? Give the name of some popular engines.

Q.2 Discuss WAP architecture. What is the function of each layer of this architecture?

Q.3 Explain the process of web publishing.

Q.4 What is DTD? Why do we use it with XML documents?

Q.5 Explain SET protocol used in credit card transactions.

Tutorial

Q.1 Discuss the various categories and characteristics of web applications.

Q.2 What are the various phases of website development? Explain them.

Q.3 What is E-payment? Why is orientation and standardization required for e-payment business?

Q.4 Write short notes :

a) Digital signatures

b) Business models

c) CSS

d) Ontology

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Computer Science & Engineering
Subject: Network Management (CSA-802)

Assignment

Q.1 What is Remote Monitoring?With a neat diagram explain the configuration of RMONS.

Q.2 Evaluate ICMP with its different messages.

Q.3 Differentiate between IPv4 and IPv6.

Q.4 Write a brief note on Management Information Base and its structure.

Q.5 Explain the working of Open Shortest Job First with suitable example.

Tutorial

Q.1 What is OID in MIB?Explain briefly.

Q.2 Explain briefly Network Management Architecture.

Q.3 Explain functions of ARP with its frame format.

Q.4 Evaluate the working of SMTP with suitable diagram.

Q.5 Define Routing. Explain different types of routing used in the network.

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Computer Science & Engineering
Subject: Internet of Things(CSA-803)

Assignment

Q.1 Describe IOT Reference Architecture and information model.

Q.2 Explain various IOT reference model with diagram.

Q.3 Define Near Field Communication Technologies and their applications.

Q.4 Explain principles of RFID.How they are linked with Internet of Things.

Q.5 Evaluate the principles of IOT in Home Automation.

Tutorial

Q.1 Discuss the building blocks of IoT.What are different types of sensors in IoT.

Q.2 Explain various security concerns to related to IoT?Discuss in detail.

Q.3 Explain Software Defined Networking .

Q.4 Differentiate between AMQP and MQTT.

Q.5 Explain the following term:

) Media Access Control

ii) Web Sockets iii) Application of IOT

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Information Technology

Subject-Compiler Design(ITA-601)

Assignment

Q.1 Describe the various data structures used in Compilers.

Q.2 Explain in detail the various phases of compiler with an example.

Q.3 Explain the various errors encountered in different phases of Compiler

Q.4 Check whether the given grammar is LL(1) or not

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Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Information Technology

Subject-Computer Networkingn(ITA-602)

Assignment

Q.1 Give explanation of different type of topologies in terms of its advantages and disadvantages.

Q.2 What do you mean by CSMA method of MAC? Define persistent and non persistent CSMA.

Q.3 Describe the use of IPConfig and Ping and write its commands.

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Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Information Technology

Subject- Advance Computer Architecture (ITA-603(A))

Assignment

Q.1 What is cache coherence protocol?Explain

Q.2 Draw and explain block diagram of Back plane Bus system.

Q.3 Explain store and forward routing with diagram.

Q.4 Describe inclusion property and memory coherence requirements.

Q.5 Differentiate between RISC & CISC scalar processors.

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Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Information Technology

Subject: Soft Computing (ITA-604(B))

Assignment

Q.1 Define the following:

i) Artificial Intelligence

ii) Soft Computing

Q.2 What is soft computing? Compare soft computing with hard computing.

Q.3 What do you mean by Production system? What are various types of production system? Write down its characteristics.

Q.4 Write short notes:(Any two) a) Crossover b) Mutation operator c) Reproduction phase of genetic algorithm d) Fuzzy membership function

Q.5 Define the architecture of a perceptron? What do you mean by linear separability?

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ii) Fuzzy Inference System
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& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P)

Department of Information Technology

Subject: Cyber Law & Ethics (ITA-605(B))

Assignment

Q.1 Explain Freedom of speech and expression in Cyberspace.

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Q.5 Write short notes (any three)

a) E-commerce salient features

b) Identity theft and fraud

c) Cyber-Torts

d) B2C and C2C

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M.P)

SSSUTMS,Sehore(M.P.)
Department of Information Technology
Subject: Web Technology (ITA-801)

Assignment

Q.1 What is search engine? What are the main principles used by a search engine to retrieve information from the web? Give the name of some popular engines.

Q.2 Discuss WAP architecture. What is the function of each layer of this architecture?

Q.3 Explain the process of web publishing.

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Q.4 Write short notes :

a) Digital signatures

b) Business models

c) CSS

d) Ontology

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Information Technology
Subject: Network Management (ITA-802(B))

Assignment

Q.1 What is Remote Monitoring?With a neat diagram explain the configuration of RMONS.

Q.2 Evaluate ICMP with its different messages.

Q.3 Differentiate between IPv4 and IPv6.

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Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Information Technology
Subject: Internet of Things(ITC-803(A))

Assignment

Q.1 Describe IOT Reference Architecture and information model.

Q.2 Explain various IOT reference model with diagram.

Q.3 Define Near Field Communication Technologies and their applications.

Q.4 Explain principles of RFID.How they are linked with Internet of Things.

Q.5 Evaluate the principles of IOT in Home Automation.

Tutorial

Q.1 Discuss the building blocks of IoT.What are different types of sensors in IoT.

Q.2 Explain various security concerns to related to IoT?Discuss in detail.

Q.3 Explain Software Defined Networking .

Q.4 Differentiate between AMQP and MQTT.

Q.5 Explain the following term:

) Media Access Control

ii) Web Sockets iii) Application of IOT

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M.P.)

SSSUTMS,Sehore(M.P.)

Department of Master in Computer Applications

Subject: Data Base Management System (MCA-2201)

Assignment

Q.1 Explain DBA. Evaluate its roles and responsibilities.

Q.2 What is generalization and specialization? Explain with example.

Q.3 Explain Normalization. Discuss 1 NF and 2 NF.

Q.4 Discuss the basic concept of transaction and explain the ACID properties.

Q.5 Describe various types of joins with example.

Tutorial

Q.1 Explain E-R modeling with example.

Q.2 What are Integrity Constraints.Explain with its types.

Q.3 Explain Data Manipulation Language with example.

Q.4 Explain functional dependency with example.

Q.5 Write short notes on:

(i) RAID

(ii) Data Warehouse

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)
Department of Master in Computer Applications
Subject: Operating System (MCA-2203)

Assignment

Q.1 What is meant by a System call? How it can be used? How does an application program use these calls during execution?

Q.2 Describe various space allocation strategies with their merits/demerits.

Q.3 Briefly explain the following
i) Mutual exclusion
ii) Critical section problem

Tutorial

Q.1 Define Process States. Draw the diagram of PCB.

Q.2 Compare Paging and Segmentation with example.

Q.3 What is meant by Thrashing? Explain various causes of thrashing.

Q.4 Explain the concept of dirty bit for improving the performance during page fault

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Sri Satya Sai University of Technology
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SSSUTMS,Sehore(M.P.)

Department of Master in Computer Applications

Subject: Internet of Things(MCA-2403)

Assignment

Q.1 Describe IOT Reference Architecture and information model.

Q.2 Explain various IOT reference model with diagram.

Q.3 Define Near Field Communication Technologies and their applications.

Q.4 Explain principles of RFID.How they are linked with Internet of Things.

Q.5 Evaluate the principles of IOT in Home Automation.

Tutorial

Q.1 Discuss the building blocks of IoT.What are different types of sensors in IoT.

Q.2 Explain various security concerns to related to IoT?Discuss in detail.

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Q.4 Differentiate between AMQP and MQTT.

Q.5 Explain the following term:

) Media Access Control

ii) Web Sockets iii) Application of IOT

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Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

SSSUTMS,Sehore(M.P.)

Department of Master in Computer Applications

Subject: Cloud Computing(MCA-2402)

Assignment

Q.1 Differentiate between Cloud Computing & Utility Computing.

Q.2 Describe the characteristics of cloud computing environment.

Q.3 Explain the layered model of cloud computing with diagram.

Tutorial

Q.1 What do you understand by SOA? How it support cloud computing?Explain.

Q.2 Describe major cloud features of Google Application Engine.

Q.3 Explain virtualization hypervisor management software.

Q.4 Write short notes on :

(i) GFS

(ii) HDFS

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Sri Satya Sai University of Technology
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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)

SCHOOL OF ENGINEERING

TIME TABLE (REMEDIAL CLASSES)

TIME TABLE - JAN JUNE 2022 **BRANCH CSE VI SEMESTER**

Day	Sem	10:00-11:00 AM	11:00-12:00 AM	12:00 -1: 00 PM	1:00-1:30 PM	1:30- 2:30 PM	2:30 - 3:30 PM	3:30- 4:30 PM
SATURDAY	**IV**	BEA-401 Energy, Ecology, Environment And Society	CSA-402 Analysis Design of Algorithm	CSA-403 Software Engineering	**L U N C H**	CSA-404 Computer Org. & Architecture	CSA-405 Operating Systems	

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HOD (CSE)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)								
SCHOOL OF ENGINEERING								
TIME TABLE (REMEDIAL CLASSES)								
TIME TABLE - JAN JUNE 2022					BRANCH CSE VI SEMESTER			
Day	**Sem**	**10:00-11:00 AM**	**11:00-12:00 AM**	**12:00 -1: 00 PM**	**1:00-1:30 PM**	**1:30- 2:30 PM**	**2:30 - 3:30 PM**	**3:30- 4:30 PM**
SATURDAY	**VI**	CSA-601 Compiler Design		CSA-602 Computer Netwaork	**L U N C H**	CSA-603 Program Elective-II	CSA-604 Program Elective-III	CSA-605 Open Core Elective - II

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

HOD (CSE)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES							
SCHOOL OF ENGINEERING							
TIME TABLE (REMEDIAL CLASSES)							
TIME TABLE - JAN JUNE 2022				BRANCH CSE VIII SEMESTER			
Day	**Sem**	**10:00-12:00 AM**	**12:00 -1:00 PM**	**1:00-1:30 PM**	**1:30- 2:30 PM**	**2:30 - 3:30 PM**	**3:30- 4:30 PM**
SATURDAY	**VIII**	CSA-801 Web Engineering	CSA-802 Program Elective-V	**L U N C H**	CSA-802 Program Elective-V	CSA-803 Open Core Elective - IV	

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M P)

HOD (CSE)

<table>
<tr><th colspan="10">SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)</th></tr>
<tr><th colspan="10">SCHOOL OF ENGINEERING</th></tr>
<tr><th colspan="10">TIME TABLE (REMEDIAL CLASSES)</th></tr>
<tr><th colspan="5">TIME TABLE - JAN-JUNE 2022</th><th colspan="5">BRANCH IT-VI SEMESTER</th></tr>
<tr><th>Day</th><th>Sem</th><th>10:00-11:00 AM</th><th>11:00-12:00 AM</th><th>12:00 -1: 00 PM</th><th>1:00-1:30 PM</th><th>1:30- 2:30 PM</th><th>2:30 - 3:30 PM</th><th>3:30- 4:30 PM</th></tr>
<tr><td>SATURDAY</td><td>VI</td><td colspan="2">ITA-601 Compiler Design</td><td>ITA-602 Computer Network</td><td>L
U
N
C
H</td><td>ITA-603 Program Elective-II</td><td>ITA-604 Program Elective-III</td><td>ITA-605 Open Core Elective - II</td></tr>
</table>

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M.P.)

HOD (IT)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)

SCHOOL OF ENGINEERING

TIME TABLE (REMEDIAL CLASSES)

TIME TABLE - JAN-JUNE 2022 **BRANCH IT-VIII SEMESTER**

Day	Sem	10:00-11:00 AM	11:00-12:00 AM	12:00 -1: 00 PM	1:00-1:30 PM	1:30- 2:30 PM	2:30 - 3:30 PM	3:30- 4:30 PM
SATURDAY	**VIII**	ITA-801 Web Technology		ITA-802 Program Elective-V	L U N C H	ITA-802 Program Elective-V	ITA-803 Open Core Elective - IV	

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HOD (IT)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)

SCHOOL OF ENGINEERING

TIME TABLE (REMEDIAL CLASSES)

TIME TABLE - JAN JUNE 2022 | **BRANCH MCA II SEMESTER**

Day	Sem	10:00-11:00 AM	11:00-12:00 AM	12:00 -1: 00 PM	1:00-1:30 PM	1:30- 2:30 PM	2:30 - 3:30 PM	3:30- 4:30 PM
SATURDAY	**II**	MCA-2201 Programming in C++	MCA-2202 Database Management System	MCA-2203 Operating System	L U N C H	MCA-2204 Theory of Computation & Algorithm		MCA-2205 E-Commerce & Governance

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HOD (MCA)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES, SEHORE (M.P.)								
SCHOOL OF ENGINEERING								
TIME TABLE (REMEDIAL CLASSES)								
TIME TABLE - JAN-JUNE 2022					BRANCH MCA-IV SEMESTER			
Day	**Sem**	**10:00-11:00 AM**	**11:00-12:00 AM**	**12:00 -1: 00 PM**	**1:00-1:30 PM**	**1:30- 2:30 PM**	**2:30 - 3:30 PM**	**3:30- 4:30 PM**
SATURDAY	**IV**	MCA-2401 Python		MCA-2402 Elective-III	**L U N C H**	MCA-2402 Elective-III	MCA-2403 Elective-IV	

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Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

HOD (MCA)

School of Hotel Management FIRST YEAR Student list 2021 (MID SEM RESULT) 1st sem					
SNO	Student Name	Father Name	Enrollment NO	Category	Result
1	Rohit Jaiswal	Mahesh Jaiswal	210706013001	OBC	PASS
2	Gourav Meena	Harbhajan Meena	210706013002	OBC	PASS
3	Abhishek Mwwada	Arjun Mewada	210706013003	OBC	ABSENT
4	Sonu Mewada	Achal Sing Mewada	210706013005	OBC	PASS
5	Ankit Mewada	Babul lal Mewada	210706013006	OBC	PASS
6	Aniket Nagar	Roop Sing Nagar	210706013007	OBC	PASS
7	Raju Mewda	Ramesh Mewdad	210706013008	OBC	PASS
8	Rahul Rajak	Bablu Rajak	210706013009	SC	PASS
9	Aman Malviya	Prakesh Malviya	210706013010	SC	ABSENT
10	Ritik Prajapati	Thakur Prajapati	210706013011	OBC	PASS
11	Mitesh Kushwaha	Roshan lal Verma	210706013012	OBC	PASS
12	Shubham Verma	Sitaram Verma	210706013013	OBC	PASS
13	Sanjay Verma	Rajendra Verma	210706013014	OBC	PASS
14	Sanjeev Savle	Ravi Savle	210706013015	SC	PASS
15	Vivek Kushwaha	Muna lal Kushwaha	210706013016	OBC	PASS
16	Sumit Bankariya	Rakesh Bankariya	210706013017	SC	PASS
17	Sachin Gour	Mathura Prasad	210706013018	OBC	PASS
18	MD Yusuf Ali	MD Maksood Ali	210706013019	OBC	PASS
19	Vishal	Kamal Sing	210706013020	SC	PASS
20	Deepak Markam	SameerMarkam	210706013021	ST	ABSENT
21	Rishabh Verma	Shadilal Verma	210706013022	OBC	PASS
22	Aman Verma	Leeladhar Verma	210706013023	OBC	PASS
23	Neeraj Patidar	Govind Patidar	210706013024	OBC	PASS
24	Devendar Meena	Narayan singh Meena	210706013025	OBC	PASS
25	Aditya Nandoda	Ramchana Nandoda	210706013026	OBC	PASS
26	Gourav	Mukesh	210706013027	SC	PASS
27	Dipesh Verma	Bhagvat Singh	210706013028	OBC	PASS
28	Yogesh Bharti	Prem Bharti	210706013029	SC	PASS
29	Sapan Pushpad	Mahesh Pushpad	210706013030	OBC	PASS
30	Pallabh Pushpad	Mukesh Pushpad	210706013031	OBC	PASS
31	Lalit	Ramdin	210706013032	OBC	PASS
32	Chandra prakesh Gour	Gordhan Gour	210706013033	OBC	PASS
33	Shubham Gour	Govind Gour	210706013034	OBC	PASS
34	Sunil Karada	Narayan Sing	210706013035	OBC	PASS
35	Guruvachan	Sujan Sing	210706013036	SC	PASS
36	Yuvraj Meena	Naresh Meena	210706013037	OBC	PASS

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M.P.)

SSSUTMS, SEHORE (M.P.)

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES, SEHORE

School of Hotel Management

REMEDIAL CLASS TIME TABLE - JULY - DEC. 2021

BRANCH : BHMCT 1st -Semester

TIME/ TABLE		4.30 PM TO 5.30 PM	
MONDAY	FOOD PRODUCTION THEORY		
TUESDAY	FOOD & BEVERAGE PRACTICAL		F&B TH
WEDNESDAY	FRONT OFFICE PRACTICA		F.O TH
THURSDAY	HOUSE KEEPING THEORY		H.K TH
FRIDAY	FOOD PRODUCTION PRACTICAL		H.K TH
SATURDAY		Assignment	

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& Medical Sciences Sehore (M P)

SSSUTMS, SEHORE (M.P.)

School of Hotel Managemenet

School of Hotel Management 2 nd Sem (MID SEM RESULT 2021)					
SNO	Student Name	Father Name	Enrollment NO	Category	Result
1	Rohit Jaiswal	Mahesh Jaiswal	210706013001	OBC	PASS
2	Gourav Meena	Harbhajan Meena	210706013002	OBC	PASS
3	Abhishek Mwwada	Arjun Mewada	210706013003	OBC	PASS
4	Sonu Mewada	Achal Sing Mewada	210706013005	OBC	PASS
5	Ankit Mewada	Babul lal Mewada	210706013006	OBC	PASS
6	Aniket Nagar	Roop Sing Nagar	210706013007	OBC	PASS
7	Raju Mewda	Ramesh Mewdad	210706013008	OBC	PASS
8	Rahul Rajak	Bablu Rajak	210706013009	SC	PASS
9	Aman Malviya	Prakesh Malviya	210706013010	SC	PASS
10	Ritik Prajapati	Thakur Prajapati	210706013011	OBC	ABSENT
11	Mitesh Kushwaha	Roshan lal Verma	210706013012	OBC	PASS
12	Shubham Verma	Sitaram Verma	210706013013	OBC	PASS
13	Sanjay Verma	Rajendra Verma	210706013014	OBC	PASS
14	Sanjeev Savle	Ravi Savle	210706013015	SC	PASS
15	Vivek Kushwaha	Muna lal Kushwaha	210706013016	OBC	PASS
16	Sumit Bankariya	Rakesh Bankariya	210706013017	SC	PASS
17	Sachin Gour	Mathura Prasad	210706013018	OBC	PASS
18	MD Yusuf Ali	MD Maksood Ali	210706013019	OBC	PASS
19	Vishal	Kamal Sing	210706013020	SC	PASS
20	Deepak Markam	SameerMarkam	210706013021	ST	ABSENT
21	Rishabh Verma	Shadilal Verma	210706013022	OBC	PASS
22	Aman Verma	Leeladhar Verma	210706013023	OBC	PASS
23	Neeraj Patidar	Govind Patidar	210706013024	OBC	PASS
24	Devendar Meena	Narayan singh Meena	210706013025	OBC	PASS
25	Aditya Nandoda	Ramchana Nandoda	210706013026	OBC	PASS
26	Gourav	Mukesh	210706013027	SC	PASS
27	Dipesh Verma	Bhagvat Singh	210706013028	OBC	PASS
28	Yogesh Bharti	Prem Bharti	210706013029	SC	PASS
29	Sapan Pushpad	Mahesh Pushpad	210706013030	OBC	PASS
30	Pallabh Pushpad	Mukesh Pushpad	210706013031	OBC	ABSENT
31	Lalit	Ramdin	210706013032	OBC	PASS
32	Chandra prakesh Gour	Gordhan Gour	210706013033	OBC	PASS
33	Shubham Gour	Govind Gour	210706013034	OBC	PASS
34	Sunil Karada	Narayan Sing	210706013035	OBC	PASS
35	Guruvachan	Sujan Sing	210706013036	SC	PASS
36	Yuvraj Meena	Naresh Meena	210706013037	OBC	PASS

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& Medical Sciences Sehore (M.P.)

SSSUTMS, SEHORE (M.P.)
SSSUTMS

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES, SEHORE

School of Hotel Management

REMEDIALTIME TABLE - Jan - June 2022 CBCS

BRANCH : BHMCT 2nd -Semester)

TIME/ TABLE /online/offline		4.00 PM TO 5,30 PM		
MONDAY	Food Production & Patisserie			
TUESDAY	Food & Beverage Service Advance		F&B TH	
WEDNESDAY	Front Office Operations & Management		F.O TH	
THURSDAY	Hotel Housekeeping Management		H.K TH	
FRIDAY	Food Science			
SATURDAY				

Registrar

Sri Satya Sai University of Technology & Medical Sciences Sehore (M P)

SCHOOL OF HOTEL MANAGEMENT

SSSUTMS, SEHORE (M.P.) SSSUTMS

Ref: SOHM/EXAM./16/2022

Date: 01/01/2022

NOTIFICATION FOR COMMENCEMENT OF PUT EXAM Dec. Jan 2021-22

This is bringing to your kind notice that the mid semester examination of **BHMCT** First sem course given below:

- BHMCT First semester will be conducted between 04/01/2022 — 09/01/2022.

Hence it is expected that all the staff and students will prepare themselves accordingly as exams will be conducted through offline mode. It is also directed that all should follow covid-19 guidelines.

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M.P)

Dean
School Of Hotel Management
SSSUTMS, Sehore

School of Hotel Management FIRST YEAR Student list 2021 (PUT SEM RESULT) Ist Sem					
SNO	Student Name	Father Name	Enrollment NO	Category	Result
1	Rohit Jaiswal	Mahesh Jaiswal	210706013001	OBC	PASS
2	Gourav Meena	Harbhajan Meena	210706013002	OBC	PASS
3	Abhishek Mwwada	Arjun Mewada	210706013003	OBC	PASS
4	Sonu Mewada	Achal Sing Mewada	210706013005	OBC	PASS
5	Ankit Mewada	Babul lal Mewada	210706013006	OBC	PASS
6	Aniket Nagar	Roop Sing Nagar	210706013007	OBC	PASS
7	Raju Mewda	Ramesh Mewdad	210706013008	OBC	PASS
8	Rahul Rajak	Bablu Rajak	210706013009	SC	PASS
9	Aman Malviya	Prakesh Malviya	210706013010	SC	PASS
10	Ritik Prajapati	Thakur Prajapati	210706013011	OBC	PASS
11	Mitesh Kushwaha	Roshan lal Verma	210706013012	OBC	PASS
12	Shubham Verma	Sitaram Verma	210706013013	OBC	PASS
13	Sanjay Verma	Rajendra Verma	210706013014	OBC	PASS
14	Sanjeev Savle	Ravi Savle	210706013015	SC	PASS
15	Vivek Kushwaha	Muna lal Kushwaha	210706013016	OBC	PASS
16	Sumit Bankariya	Rakesh Bankariya	210706013017	SC	PASS
17	Sachin Gour	Mathura Prasad	210706013018	OBC	PASS
18	MD Yusuf Ali	MD Maksood Ali	210706013019	OBC	PASS
19	Vishal	Kamal Sing	210706013020	SC	PASS
20	Deepak Markam	SameerMarkam	210706013021	ST	PASS
21	Rishabh Verma	Shadilal Verma	210706013022	OBC	PASS
22	Aman Verma	Leeladhar Verma	210706013023	OBC	PASS
23	Neeraj Patidar	Govind Patidar	210706013024	OBC	PASS
24	Devendar Meena	Narayan singh Meena	210706013025	OBC	PASS
25	Aditya Nandoda	Ramchana Nandoda	210706013026	OBC	PASS
26	Gourav	Mukesh	210706013027	SC	PASS
27	Dipesh Verma	Bhagvat Singh	210706013028	OBC	PASS
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33	Shubham Gour	Govind Gour	210706013034	OBC	PASS
34	Sunil Karada	Narayan Sing	210706013035	OBC	PASS
35	Guruvachan	Sujan Sing	210706013036	SC	PASS
36	Yuvraj Meena	Naresh Meena	210706013037	OBC	PASS

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M.P.)

SSSUTMS SEHORE (M.P.)
SSSUTMS

School Of Hotel Management
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES
[Established by Govt. of M.P. & Registered Under Section 2(F) of UGC Act. 1956]
Approved by Madhya Pradesh Private University Regulatory Commission
SH-18, Bhopal-Indore Road, Pachama, Sehore Distt. Sehore (M.P.) Pin Code – 466001

Ref: SOHM/EXAM./29/2022

Date: 18/04/2022

NOTIFICATION FOR COMMENCEMENT OF PUT EXAM 2022

This is bringing to your kind notice that the mid semester examination of **BHMCT** IInd Sem course given below:

- BHMCT First yearr will be conducted between 25/04/2022 — 27/04/2022.

Hence it is expected that all the staff and students will prepare themselves accordingly as exams will be conducted through offline mode. It is also directed that all should follow covid-19 guidelines.

Registrar
Sri Satya Sai University of Technology & Medical Sciences Sehore (M.P.)

Dean
School Of Hotel Management

Dean
School of Hotel Management
SSSUTMS, Sehore

School of Hotel Management 2 nd Sem (PUT RESULT 2021)					
SNO	Student Name	Father Name	Enrollment NO	Category	Result
1	Rohit Jaiswal	Mahesh Jaiswal	210706013001	OBC	PASS
2	Gourav Meena	Harbhajan Meena	210706013002	OBC	PASS
3	Abhishek Mwwada	Arjun Mewada	210706013003	OBC	PASS
4	Sonu Mewada	Achal Sing Mewada	210706013005	OBC	PASS
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10	Ritik Prajapati	Thakur Prajapati	210706013011	OBC	PASS
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12	Shubham Verma	Sitaram Verma	210706013013	OBC	PASS
13	Sanjay Verma	Rajendra Verma	210706013014	OBC	PASS
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15	Vivek Kushwaha	Muna lal Kushwaha	210706013016	OBC	PASS
16	Sumit Bankariya	Rakesh Bankariya	210706013017	SC	PASS
17	Sachin Gour	Mathura Prasad	210706013018	OBC	PASS
18	MD Yusuf Ali	MD Maksood Ali	210706013019	OBC	PASS
19	Vishal	Kamal Sing	210706013020	SC	PASS
20	Deepak Markam	SameerMarkam	210706013021	ST	PASS
21	Rishabh Verma	Shadilal Verma	210706013022	OBC	PASS
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26	Gourav	Mukesh	210706013027	SC	PASS
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28	Yogesh Bharti	Prem Bharti	210706013029	SC	PASS
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34	Sunil Karada	Narayan Sing	210706013035	OBC	PASS
35	Guruvachan	Sujan Sing	210706013036	SC	ABSENT
36	Yuvraj Meena	Naresh Meena	210706013037	OBC	PASS

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Sri Satya Sai University of Technology
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SSSUTMS, SEHORE (M.P.)
SSSUTMS

School of Hotel Management

Project /Assignment guideline (Advance Learner)

Quality of work

Exceptionally accurate in work, very thorough usually unaided	
Maintains a high standard of quality	
Generally good quality with some assistance	
Performance is uneven	
Inaccurate and slow at work	

Ability to communicate (oral/written)

Very confident, demonstrates outstanding confidence & ability both spoken/written	
Confident, delivers information	
Communicates adequately, but lacks depth and confidence	
Hesitant, lacks, confidence in spoken/written communication	
Very inanimate, unable to express in spoken or written work	

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SSSUTMS, SEHORE (M.P.)
SSSUTMS

SCHOOL OF HOTEL MANAGEMENT
SEHORE

A

PROJECT REPORT

ON

"FRONT OFFICE MANAGEMENT"

Submitted to

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES SEHORE MP

FOR THE FULLFILLMENT OF THE DEGREE OF BACHELOR OF HOTEL MANAGEMENT & CATERING TECHNOLOGY

2021 – 22

SUBMITTED BY

ROHIT JAISWAL

3rd Semester

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M.P.)

SCHOOL OF HOTEL MANAGEMENT
SEHORE

A

PROJECT REPORT

ON

"FRONT OFFICE MANAGEMENT"

Submitted to

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES SEHORE MP

FOR THE FULLFILLMENT OF THE DEGREE OF BACHELOR OF HOTEL MANAGEMENT & CATERING TECHNOLOGY

2021 – 22

SUBMITTED BY

VISHAL

3rd Semester

Registrar
Sri Satya Sai University of Technology
& Medical Sciences Sehore (M.P.)

SCHOOL OF PHARMACY

Sri Satya Sai University of Technology and Medical Science, Sehore

B. Pharm I sem Internal Assessment (Theory Exam) Marks (Dec-2021)

S.N.	Roll/Enroll No.	Name of Student	BP 101			BP 102			BP 103			BP 104			BP 105			BP 106		
			SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL
1	210304013001	YASHRAJ KUSHWAHA	10	7	17	11	8	19	10	8	18	11	8	19	7	4	11	9	3	12
2	210304013002	YUVRAJ SINGH SONGARA	9	7	16	10	8	18	10	9	19	11	9	20	7	3	10	8	3	11
3	210304013003	SHUBHAM SEN	12	6	18	10	9	19	11	9	20	10	9	19	8	4	12	9	3	12
4	210304013004	AYUSH JAISWAL	12	9	21	11	7	18	11	8	19	12	8	20	7	3	10	8	3	11
5	210304013005	ANKIT THAKUR	8	9	17	12	9	21	10	9	19	11	9	20	8	4	12	9	3	12
6	210304013006	ANISH SHUKLA	10	8	18	11	8	19	12	9	21	10	9	19	6	4	10	7	4	11
7	210304013007	SHARAD SONI	10	8	18	11	9	20	10	7	17	11	7	18	7	4	11	8	4	12
8	210304013008	AMEEN KHAN	10	9	19	11	8	19	12	7	19	12	8	20	8	3	11	8	4	12
9	210304013009	DEEPAK MALVIYA	12	9	21	12	8	20	10	8	18	10	9	19	7	3	10	8	4	12
10	210304013010	ALOK VERMA	10	8	18	13	8	21	12	7	19	11	7	18	7	3	10	8	4	12
11	210304013011	MAHENDRA PAL	11	7	18	11	9	20	12	8	20	12	8	20	7	4	11	9	4	13
12	210304013012	ARVIND JAYASWAL	9	9	18	12	9	21	11	9	20	12	9	21	7	3	10	9	3	12
13	210304013013	AJAY PANCHAL	11	8	19	11	8	19	12	9	21	12	9	21	8	3	11	9	3	12
14	210304013014	SHOYAB	11	9	20	11	8	19	12	8	20	12	8	20	8	4	12	9	3	12
15	210304013015	THAKUR SINGH THAKUR	10	7	17	10	8	18	11	7	18	11	7	18	9	4	13	8	3	11
16	210304013016	KALLU KHA	9	8	17	11	7	18	11	8	19	10	8	18	9	3	12	8	3	11
17	210304013017	DHANU KUMAR	10	9	19	10	9	19	12	8	20	13	8	21	8	3	11	8	3	11
18	210304013018	NARGISH	12	8	20	11	9	20	12	7	19	12	7	19	7	3	10	8	3	11
19	210304013019	VIKASH PATIDAR	10	7	17	11	7	18	10	8	18	11	8	19	8	3	11	7	3	10
20	210304013020	ASHAFAK MANSURI	10	8	18	11	9	20	11	9	20	12	9	21	7	3	10	7	4	11
21	210304013021	AMAN PRAJAPATI	11	8	19	10	8	18	10	7	17	14	7	21	8	4	12	7	3	10
22	210304013022	VASIM MANSURI	11	9	20	10	7	17	11	8	19	10	8	18	7	4	11	7	3	10
23	210304013023	UMESH PATIDAR	10	9	19	11	9	20	12	9	21	13	9	22	8	4	12	8	4	12
24	210304013024	SANDEEP NISHAD	10	8	18	10	8	18	12	9	21	13	9	22	9	4	13	8	3	11
25	210304013025	SHOAIB KHAN	10	8	18	12	9	21	10	9	19	11	9	20	8	4	12	9	4	13
26	210304013026	AMAN SAGWALIYA	11	8	19	11	8	19	12	9	21	12	9	21	8	4	12	7	4	11
27	210304013027	SOHEL MANSURI	10	8	18	10	8	18	12	9	21	12	9	21	7	3	10	9	4	13
28	210304013028	SANTOSH	12	8	20	11	9	20	10	7	17	11	7	18	8	3	11	7	4	11
29	210304013029	NAWAB KHAN	10	7	17	11	9	20	11	8	19	10	8	18	8	3	11	9	4	13
30	210304013030	ABHISHEK MEWADA	12	8	20	10	9	19	10	7	17	11	7	18	8	3	11	7	4	11

	210304013031	DURGESH	10	7	**17**	10	8	**18**	11	9	**20**	11	9	**20**	8	3	**11**	7	4	**11**
32	210304013032	NIRAJ PRASAD MALVIYA	10	8	**18**	11	8	**19**	12	9	**21**	11	9	**20**	7	3	**10**	7	3	**10**
33	210304013033	NEERAJ MEWADA	10	8	**18**	10	9	**19**	12	8	**20**	12	8	**20**	8	3	**11**	8	4	**12**
34	210304013034	YASHWANT	10	7	**17**	11	9	**20**	12	7	**19**	12	7	**19**	8	3	**11**	7	3	**10**
35	210304013035	SUMIT MALVIYA	11	7	**18**	10	8	**18**	11	9	**20**	11	9	**20**	8	4	**12**	8	4	**12**
36	210304013036	NAGMA	10	7	**17**	10	9	**19**	12	7	**19**	11	7	**18**	8	4	**12**	6	4	**10**
37	210304013037	ASHISH MALVIYA	11	7	**18**	10	7	**17**	11	8	**19**	13	8	**21**	8	3	**11**	7	4	**11**
38	210304013038	ASHIF KHAN	10	7	**17**	11	9	**20**	11	9	**20**	10	9	**19**	8	3	**11**	8	3	**11**
39	210304013039	SARFARAZ QURESHI	11	7	**18**	12	7	**19**	11	8	**19**	12	8	**20**	7	3	**10**	7	3	**10**
40	210304013040	ADITYA KUMAR THAKUR	11	7	**18**	11	7	**18**	10	8	**18**	12	9	**21**	7	3	**10**	7	3	**10**
41	210304013041	VAIBHAV PATIDAR	11	8	**19**	11	8	**19**	13	8	**21**	13	8	**21**	7	3	**10**	7	4	**11**
42	210304013042	HARSH PATIDAR	11	9	**20**	12	9	**21**	13	7	**20**	12	8	**20**	7	3	**10**	7	3	**10**
43	210304013043	EGURLA MAHESH	12	8	**20**	11	8	**19**	11	8	**19**	13	9	**22**	7	3	**10**	8	3	**11**
44	210304013044	KHUSNAL TIWARI	10	7	**17**	11	9	**20**	12	7	**19**	12	7	**19**	9	4	**13**	8	4	**12**
45	210304013045	SUDARSHAN	11	8	**19**	10	8	**18**	12	9	**21**	10	9	**19**	9	3	**12**	9	4	**13**
46	210304013046	MO ZAKI KHAN	12	9	**21**	12	8	**20**	10	9	**19**	12	9	**21**	9	4	**13**	9	3	**12**
47	210304013047	ANKIT PARMAR	10	8	**18**	11	9	**20**	13	7	**20**	11	7	**18**	7	3	**10**	8	3	**11**
48	210304013048	ANMOL MEWADA	11	7	**18**	11	8	**19**	11	8	**19**	10	8	**18**	8	3	**11**	7	3	**10**
49	210304013049	KAVYA SOLANKI	10	8	**18**	10	9	**19**	11	9	**20**	11	9	**20**	8	3	**11**	8	3	**11**
50	210304013050	IRSAD KHAN	10	9	**19**	11	8	**19**	12	8	**20**	11	8	**19**	7	3	**10**	7	3	**10**
51	210304013051	RAKESH KUMAR YADAV	10	8	**18**	10	8	**18**	12	7	**19**	10	7	**17**	9	3	**12**	8	4	**12**
52	210304013052	SAGAR THAKUR	12	7	**19**	11	9	**20**	12	7	**19**	10	7	**17**	9	3	**12**	7	4	**11**
53	210304013053	SHUBHAM PATIDAR	10	8	**18**	11	9	**20**	11	9	**20**	11	9	**20**	9	3	**12**	8	4	**12**
54	210304013054	SHANI PRAKASH	10	9	**19**	11	9	**20**	10	7	**17**	12	7	**19**	7	3	**10**	9	4	**13**
55	210304013055	SUNIL	11	8	**19**	12	7	**19**	13	8	**21**	12	8	**20**	9	4	**13**	8	4	**12**
56	210304013056	KISMAT KHAN	10	5	**15**	11	9	**20**	13	9	**22**	13	9	**22**	7	4	**11**	8	4	**12**
57	210304013057	ABHISHEK KUMAR	10	8	**18**	11	8	**19**	12	9	**21**	12	9	**21**	9	4	**13**	7	3	**10**
58	210304013058	KULDEEP MEWADA	10	8	**18**	10	9	**19**	10	8	**18**	12	8	**20**	8	3	**11**	8	3	**11**
59	210304013059	VISHAL DHAKAD	10	7	**17**	11	9	**20**	13	9	**22**	12	9	**21**	9	3	**12**	8	3	**11**
60	210304013060	SHIVANI VERMA	10	7	**17**	10	9	**19**	10	7	**17**	12	7	**19**	7	3	**10**	8	3	**11**
61	210304013061	SHAHRUKH BEG	10	7	**17**	10	8	**18**	12	9	**21**	12	9	**21**	8	3	**11**	7	4	**11**
62	210304013062	YASH RAO	11	8	**19**	10	8	**18**	10	9	**19**	13	9	**22**	9	3	**12**	7	3	**10**
63	210304013063	SHAHIR MANSOORI	10	7	**17**	10	7	**17**	10	8	**18**	13	8	**21**	7	3	**10**	8	4	**12**

	210304013064	RAKESH GOUR	10	7	17	10	9	19	11	9	20	11	9	20	8	3	11	7	3	10
65	210304013065	GOUTAM PANWAR	10	8	18	10	8	18	12	9	21	11	9	20	9	3	12	8	4	12
66	210304013066	ANKIT THAKUR	10	7	17	11	9	20	12	9	21	10	9	19	8	3	11	6	4	10
67	210304013067	REHAN MANSURI	9	8	17	10	8	18	14	8	22	12	8	20	9	3	12	7	4	11
68	210304013068	PRADEEP CHOUHAN	13	8	21	12	8	20	12	7	19	10	7	17	7	3	10	8	3	11
69	210304013069	ARCHANA KUMARI	12	7	19	10	8	18	12	9	21	10	9	19	9	3	12	7	3	10
70	210304013070	RITIK	11	8	19	12	8	20	11	9	20	12	9	21	8	3	11	7	3	10
71	210304013071	HEMANT RATHORE	12	7	19	12	9	21	12	8	20	11	8	19	9	3	12	7	4	11
72	210304013072	VISHAL MEWADA	11	7	18	11	7	18	10	8	18	13	8	21	8	3	11	7	3	10
73	210304013073	PALAK BISORIA	13	9	22	11	8	19	12	7	19	13	7	20	9	3	12	8	3	11
74	210304013074	SHAHNAWAZ QURESHI	12	8	20	10	8	18	7	8	15	13	9	22	7	4	11	8	4	12
75	210304013075	SHUBHAM THAKUR	11	7	18	12	9	21	10	9	19	12	9	21	8	4	12	9	4	13
76	210304013076	AKASH AHIRWAR	12	7	19	12	8	20	12	8	20	12	9	21	8	4	12	9	3	12
77	210304013077	BHASKAR MUKHIYA	10	8	18	11	9	20	12	9	21	12	7	19	8	4	12	8	3	11
78	210304013078	MOHIT VERMA	12	8	20	10	8	18	11	8	19	15	8	23	8	4	12	7	3	10
79	210304013079	PAYAL THAKUR	11	8	19	12	8	20	10	9	19	10	9	19	9	4	13	8	3	11
80	210304013080	BHAVNA YADAV	12	7	19	11	8	19	11	9	20	10	9	19	9	3	12	7	3	10
81	210304013081	ROHIT MEENA	11	7	18	10	7	17	10	8	18	12	7	19	9	3	12	8	4	12
82	210304013082	AMARNATH VAISHNAV	10	9	19	12	9	21	11	9	20	11	9	20	9	3	12	7	4	11
83	210304013083	CHAHAT RUTHIA	13	7	20	10	8	18	12	8	20	12	9	21	8	3	11	8	4	12
84	210304013084	HEMANT SINGH SISODIYA	12	7	19	10	8	18	14	9	23	13	9	22	8	3	11	9	4	13
85	210304013085	YASH GOUR	11	8	19	11	8	19	14	7	21	13	7	20	8	3	11	8	4	12
86	210304013086	MONIKA	11	9	20	13	7	20	12	8	20	12	8	20	8	3	11	8	4	12
87	210304013087	VIKASH BILAWDIYA	12	7	19	12	9	21	12	9	21	12	9	21	7	3	10	7	3	10
88	210304013088	CHETAN MEWADA	10	8	18	10	8	18	11	8	19	12	8	20	7	4	11	8	3	11
89	210304013089	PRADEEP VISHVAKARMA	10	8	18	11	9	20	12	8	20	11	8	19	7	3	10	8	3	11
90	210304013090	DEEPAK VERMA	10	9	19	12	8	20	12	8	20	12	8	20	7	3	10	8	3	11
91	210304013091	CHANDRAPAL SINGH THAKUR	10	8	18	12	8	20	13	7	20	11	7	18	8	4	12	7	4	11
92	210304013092	MOHD. AKIB	10	8	18	12	8	20	13	9	22	11	9	20	8	3	11	7	3	10
93	210304013093	RAI SINGH	12	7	19	11	8	19	11	9	20	12	9	21	9	4	13	8	4	12
94	210304013094	ACHAL SINGH	11	8	19	11	8	19	11	9	20	13	9	22	7	4	11	7	3	10

	210304013095	PUNEET CHAWDA	12	7	**19**	11	9	**20**	12	7	**19**	12	7	**19**	9	4	**13**	8	4	**12**
96	210304013096	ABHISHEK	12	7	**19**	10	8	**18**	11	9	**20**	12	9	**21**	7	4	**11**	6	4	**10**
97	210304013097	GOVIND MEWADA	12	8	**20**	13	7	**20**	11	8	**19**	13	8	**21**	9	4	**13**	7	4	**11**
98	210304013098	SHAILENDRA SINGH	11	7	**18**	12	9	**21**	12	9	**21**	12	9	**21**	7	4	**11**	8	3	**11**
99	210304013099	KANAK RAI	12	7	**19**	11	8	**19**	11	9	**20**	10	9	**19**	9	3	**12**	7	3	**10**

S.M.* SESSIONAL MARKS

C.M.* CONTINEOUS MODE

DEAN

Dean
School of Pharmacy
Sri Satya Sai University of Technology
and Medical Sciences, Sehore (M.P.)

SCHOOL OF PHARMACY

Sri Satya Sai University of Technology and Medical Science, Sehore

B. Pharm III sem Internal Assessment (Theory Exam) Marks (Dec-2021)

S.N.	Roll/Enroll No.	Name of Student	BP 301			BP 302			BP 303			BP 304		
			SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL
1	1808101096	UTTAM	7	8	15	11	8	19	8	8	16	9	8	17
2	190304013019	MR. SHRAVAN	9	8	17	7	8	15	7	9	16	8	9	17
3	190304013031	MR. SAURABH RAUTEL	9	7	16	7	9	16	11	9	20	10	9	19
4	190304013036	MR. MUSHARRAF SHAH	7	8	15	7	7	14	7	8	15	7	8	15
5	190304013044	MR. AKASH	9	8	17	12	9	21	10	9	19	11	9	20
6	190304013060	MR. VISHAL MEWADA	10	8	18	11	8	19	12	9	21	10	9	19
7	190304013075	PIYUSH NAGAR	8	8	16	11	9	20	10	7	17	11	7	18
8	190304013081	RAJESHWARI GOUR	8	7	15	8	8	16	9	7	16	7	8	15
9	190304013088	GEETIKA KAUSHAL	10	9	19	9	8	17	10	8	18	10	9	19
10	200304013001	MR. DEVENDRA GOUR	11	8	19	9	8	17	12	7	19	11	7	18
11	200304013002	MR. AJAY KUMAR SINGH	10	8	18	7	9	16	12	8	20	12	8	20
12	200304013003	MISS. RANI MEWADA	12	9	21	12	9	21	11	9	20	12	9	21
13	200304013004	MR. PRATIPAL SINGH THAKUR	9	8	17	7	8	15	12	9	21	12	9	21
14	200304013005	MR. ADITYA SHARMA	7	9	16	11	8	19	12	8	20	12	8	20
15	200304013006	MR. RAJ MANGAL SINGH	10	9	19	10	8	18	11	7	18	7	7	14
16	200304013007	MR. ARUN NAGAR	8	8	16	11	7	18	11	8	19	10	8	18
17	200304013008	MR. DEEPAK MEWADA	7	8	15	8	9	17	12	8	20	13	8	21
18	200304013009	MR. RAVENDRA PAL SINGH LODHI	9	9	18	11	9	20	12	7	19	12	7	19
19	200304013010	MR. LUKMAN KHAN	8	8	16	9	7	16	10	8	18	11	8	19
20	200304013011	MR. ABHISHEK KARMODIYA	12	8	20	11	9	20	11	9	20	12	9	21
21	200304013012	MR. RAKESH DHAKAD	10	9	19	7	8	15	8	7	15	7	7	14
22	200304013013	MR. OM BARELA	7	8	15	10	7	17	11	8	19	10	8	18
23	200304013014	MR. AKRAM MANSURI	12	7	19	11	9	20	12	9	21	9	9	18
24	200304013015	MR. SATISH KUMAR YADAV	8	8	16	8	8	16	12	9	21	9	9	18

25	200304013016	MR. MOHAMMAD SUHAIB SIDDIQUI	9	8	17	12	9	21	10	9	19	11	9	20
26	200304013017	MR. RAVINDRA NAGAR	12	8	20	11	8	19	12	9	21	12	9	21
27	200304013018	MR. YASH NAGAR	12	9	21	10	8	18	12	9	21	12	9	21
28	200304013019	MR. VIKAS VERMA	8	8	16	11	9	20	10	7	17	11	7	18
29	200304013020	MR. PRADUMN PARAMR	10	8	18	11	9	20	11	8	19	10	8	18
30	200304013021	MRS. POOJA SHARMA	9	9	18	7	9	16	8	7	15	11	7	18
31	200304013022	MR. TEJPAL GOUR	12	8	20	10	8	18	11	9	20	11	9	20
32	200304013023	MR. AMAY DASONDI	7	8	15	7	8	15	12	9	21	11	9	20
33	200304013024	MR. DEVENDRA SEN	10	8	18	10	9	19	12	8	20	12	8	20
34	200304013025	MR. RAHUL KUMAR	9	8	17	11	9	20	12	7	19	12	7	19
35	200304013026	MR. NAGIN VERMA	11	8	19	10	8	18	11	9	20	11	9	20
36	200304013027	MR. HARIOM VERMA	9	9	18	9	9	18	12	7	19	11	7	18
37	200304013028	MR. ABHISHEK MEWADA	8	8	16	9	7	16	11	8	19	9	8	17
38	200304013029	MR. VAIBHAV PRAJAPAT	9	7	16	7	9	16	11	9	20	10	9	19
39	200304013030	MISS. SAPANA MEWADA	8	9	17	12	7	19	11	8	19	12	8	20
40	200304013031	MRS. ANJOO SINGH	7	9	16	8	7	15	8	8	16	7	9	16
41	200304013032	MISS. PRATIKSHA MEWADA	13	8	21	11	8	19	13	8	21	13	8	21
42	200304013033	MR. SHUDHANSHU SHARMA	11	9	20	12	9	21	13	7	20	12	8	20
43	200304013034	MR. JAHIR KHAN	10	9	19	7	8	15	8	8	16	7	9	16
44	200304013035	MR. ABDULLA KHAN	11	8	19	11	9	20	12	7	19	9	7	16
45	200304013036	MR. MOHADDIS ALI	9	9	18	10	8	18	12	9	21	10	9	19
46	200304013037	MR. DEVRAJ PATIDAR	8	8	16	7	8	15	8	9	17	7	9	16
47	200304013038	MR. KAMAKHYA JI SINGH	9	9	18	11	9	20	13	7	20	11	7	18
48	200304013039	MR. ANKIT PATHARIYA	9	8	17	11	8	19	11	8	19	10	8	18
49	200304013040	MR. SAMSHAD ALI	10	7	17	10	9	19	8	9	17	11	9	20
50	200304013041	MR. ROMIT RAGHUVANSHI	7	9	16	7	8	15	12	8	20	11	8	19
51	200304013042	MR. SAHIL SHAH	11	8	19	10	8	18	12	7	19	10	7	17

52	200304013043	MR. IQBAL KHAN	10	9	19	11	9	20	9	7	16	10	7	17
53	200304013044	MR. AASHIF BAIG	12	8	20	11	9	20	11	9	20	11	9	20
54	200304013045	MR. SOURABH DANGI	10	9	19	11	9	20	9	7	16	9	7	16
55	200304013046	MRS. OMLATA MEWADA	12	9	21	9	7	16	13	8	21	13	8	21
56	200304013047	MR. AKASH KUSHWAH	12	7	19	11	9	20	13	9	22	13	9	22
57	200304013048	MR. VIKAS DUBE	9	8	17	11	8	19	12	9	21	12	9	21
58	200304013049	MR. BHUPENDRA MEWADA	8	7	15	8	9	17	8	8	16	7	8	15
59	200304013050	MR. KAPIL KUSHWAH	11	9	20	11	9	20	13	9	22	12	9	21
60	200304013051	MR. TOSHIPH KHAN	7	8	15	8	9	17	8	7	15	7	7	14
61	200304013052	MR. RAVI VISHWAKARMA	11	9	20	7	8	15	12	9	21	9	9	18
62	200304013053	MR. HARIOM MEWADA	11	8	19	8	8	16	9	9	18	11	9	20
63	200304013054	MR. SHAKEEL KHAN	7	8	15	7	7	14	7	8	15	7	8	15
64	200304013055	MR. SANDIP PATIDAR	11	7	18	10	9	19	11	9	20	11	9	20
65	200304013056	MR. RAJ VERMA	9	8	17	10	8	18	12	9	21	11	9	20
66	200304013057	MR. LOKENDRA RAJPOOT	10	8	18	11	9	20	12	9	21	10	9	19
67	200304013058	MR. ANKUSH BHAVSAR	8	8	16	7	8	15	14	8	22	12	8	20
68	200304013059	MR. NARENDRA PATIDAR	12	8	20	12	8	20	12	7	19	10	7	17
69	200304013060	MR. SHUBHAM	11	8	19	10	8	18	12	9	21	10	9	19
70	200304013061	MR. SHUBHAM PARMAR	10	8	18	12	8	20	11	9	20	12	9	21
71	200304013062	MR. RAVINDRA MEWADA	10	8	18	12	9	21	12	8	20	11	8	19
72	200304013063	MR. KHALID KHAN	7	9	16	7	7	14	8	8	16	7	8	15
73	200304013064	MR. SUSHIL SEN	12	7	19	11	8	19	12	7	19	9	7	16
74	200304013065	MR. VIRAT SINGH	8	8	16	7	8	15	7	8	15	7	9	16
75	200304013066	MR. DHANANJAY SHARMA	9	8	17	12	9	21	9	9	18	9	9	18
76	200304013067	MR. SAYYED FAIZAN ALI	6	8	14	12	8	20	12	8	20	12	9	21
77	200304013068	MISS. KAVITA YADAV	7	7	14	7	9	16	7	9	16	7	7	14
78	200304013069	MR. MOHAN	9	9	18	9	8	17	7	8	15	10	8	18

79	200304013070	MR. AJAY MEWADA	8	9	17	12	8	20	10	9	19	10	9	19
80	200304013071	MR. DINESH SHARMA	10	8	18	11	8	19	11	9	20	10	9	19
81	200304013072	MR. AADARSH PATIDAR	7	8	15	8	7	15	7	8	15	7	7	14
82	200304013073	MR. KAPIL KUMAR SEN	12	9	21	12	9	21	8	9	17	11	9	20
83	200304013074	MR. TRILOK	9	8	17	10	8	18	7	8	15	9	9	18
84	200304013075	MR. ZAINUL KHAN	11	8	19	10	8	18	14	9	23	12	9	21
85	200304013076	MR. BANTI JAISWAL	11	9	20	11	8	19	14	7	21	9	7	16
86	200304013077	MR. SANDEEP MALVIYA	10	8	18	13	7	20	8	8	16	11	8	19
87	200304013078	MR. NEERAJ GOUR	10	7	17	12	9	21	12	9	21	12	9	21
88	200304013079	MR. HARSHIT CHANDRAVANSHI	8	8	16	10	8	18	8	8	16	12	8	20
89	200304013080	MR. AYUSH RAJPUT	8	9	17	11	9	20	12	8	20	11	8	19
90	200304013081	MR. AASHISH PARMAR	11	8	19	12	8	20	12	8	20	12	8	20
91	200304013082	MR. GANESH	11	8	19	12	8	20	13	7	20	11	7	18
92	200304013083	MR. HARSHIT PRAJAPATI	9	8	17	12	8	20	13	9	22	11	9	20
93	200304013084	MR. DEEPANSHU PAL	7	8	15	11	8	19	11	9	20	9	9	18
94	200304013085	MR. YASHWANT THAKUR	10	8	18	11	8	19	11	9	20	11	9	20
95	200304013086	MR. CHETAN	10	9	19	11	9	20	12	7	19	9	7	16
96	200304013087	MR. ANSHUL AGRAWAL	8	8	16	7	8	15	8	9	17	7	9	16
97	200304013088	MR. SATISH MEWADA	7	8	15	13	7	20	8	8	16	9	8	17
98	200304013089	MISS. TANU PATEL	11	7	18	12	9	21	12	9	21	12	9	21
99	200304013090	MR. SUBHAM	10	8	18	10	9	19	10	8	18	9	8	17
100	200304013091	MR. DEEPAK MEENA	8	9	17	9	9	18	8	7	15	7	9	16
101	200304013092	MR. JITENDRA HIHOR	7	8	15	7	8	15	12	8	20	10	8	18
102	200304013093	MR. SAURABH KUMAR	9	8	17	7	8	15	11	9	20	10	9	19
103	200304013094	MISS. RASHMI DANGI	11	9	20	11	9	20	12	7	19	11	8	19
104	200304013095	MR. GAJENDRA SINGH THAKUR	10	8	18	11	7	18	13	8	21	11	8	19
105	200304013096	MR. VIKAS MEENA	9	7	16	10	9	19	9	9	18	9	9	18

106	200304013097	MR. IRFAN	7	8	**15**	7	8	**15**	9	9	**18**	7	9	**16**
107	200304013098	MR. HARSHIT KUMAR GUPTA	10	9	**19**	9	8	**17**	8	8	**16**	7	8	**15**
108	200304013099	MR. ABHISHEK MEWADA	7	9	**16**	11	9	**20**	8	7	**15**	8	7	**15**
109	200304013100	MR. NIKHIL MEWADA	7	8	**15**	10	7	**17**	9	8	**17**	7	7	**14**

S.M.* SESSIONAL MARKS

C.M.* CONTINEOUS MODE

DEAN

Dean
School of Pharmacy
Sri Satya Sai University of Technology
and Medical Sciences, Sehore (M.P.)

SCHOOL OF PHARMACY

Sri Satya Sai University of Technology and Medical Science, Sehore

B. Pharm Vth sem Internal Assessment (Theory Exam) Marks (DEC-2021)

S.N.	Roll/Enroll No.	Name of Student	BP501			BP502			BP503			BP504			BP505		
			S.M*	C.M.*	Tot.	S.M*	C.M.*	Tot.	S.M*	C.M.*	Tot.	S.M*	C.M.*	Tot.	S.M*	C.M.*	Tot.
1	1808101095	Mr. BILAL ANSARI	8	7	15	12	8	20	10	9	19	11	8	19	11	6	17
2	1808101109	RATI RAM	9	7	16	10	8	18	8	8	16	10	9	19	9	9	18
3	190304013001	Mr. SHIV KUMAR JAISWAL	7	6	13	9	7	16	8	8	16	10	5	15	10	7	17
4	190304013002	MR. ABHISHEK KUSHWAHA	12	9	21	10	9	19	10	7	17	9	9	18	9	7	16
5	190304013003	MS. KHUSHI RATHORE	8	9	17	10	9	19	11	8	19	10	9	19	11	8	19
6	190304013004	MR. MUKESH BHURA	7	8	15	10	10	20	10	9	19	10	8	18	12	8	20
7	190304013005	MR. ARJUN HTILA	8	8	16	8	9	17	9	8	17	10	9	19	11	7	18
8	190304013006	MR. SURENDRA VERMA	10	9	19	10	8	18	9	9	18	9	8	17	9	8	17
9	190304013007	MR. ALI HUSAIN	12	9	21	11	9	20	9	9	18	10	9	19	11	7	18
10	190304013008	MR. AMAN TAMRAKAR	10	8	18	9	9	18	8	9	17	8	9	17	10	8	18
11	190304013009	MR. NITINMISHRA	9	7	16	10	8	18	8	8	16	10	9	19	9	9	18
12	190304013010	MR. AVISH GURJAR	9	9	18	13	8	21	9	9	18	7	9	16	11	8	19
13	190304013011	MR. PAVAN	8	8	16	11	9	20	10	7	17	10	9	19	12	7	19
14	190304013012	MR. AMAN VERMA	11	9	20	8	9	17	9	9	18	9	8	17	8	8	16
15	190304013013	MR. RITURAJ SINGH RAJPUT	8	7	15	10	10	20	9	9	18	8	9	17	9	9	18
16	190304013014	MR. YASH MUKATI	9	8	17	7	8	15	8	8	16	7	9	16	8	8	16
17	190304013015	MR. KSHITIZ JAISWAL	10	9	19	11	8	19	10	8	18	11	7	18	10	7	17
18	190304013016	RAKESH KUMAR KUMBHKAR	12	8	20	9	9	18	9	7	16	9	9	18	9	8	17
19	190304013017	ABHISHEK VISHWAKARMA	10	7	17	10	8	18	7	8	15	8	7	15	9	9	18
20	190304013018	MR. SHAIKH GANEE	10	8	18	9	8	17	10	8	18	8	9	17	11	8	19
21	190304013020	MISS. NEHA YADAV	11	8	19	10	9	19	10	8	18	9	7	16	8	9	17

22	190304013021	MR. SHIV PRATAP THAKUR	11	9	20	8	9	17	10	8	18	9	7	16	8	8	16
23	190304013022	MR. LALIT SHARMA	10	9	19	8	10	18	8	9	17	7	9	16	10	7	17
24	190304013023	MR. PRADEEP VERMA	8	8	16	8	9	17	8	7	15	8	9	17	8	8	16
25	190304013025	MR. MO REHAN ANSARI	8	8	16	9	9	18	9	8	17	10	9	19	12	7	19
26	190304013026	MR. VISHAL VERMA	11	8	19	9	7	16	8	8	16	8	8	16	9	7	16
27	190304013027	MR. DEVENDRA PARMAR	8	8	16	8	8	16	7	9	16	9	9	18	11	8	19
28	190304013028	MR. RAGHUVEER THAKUR	12	8	20	9	7	16	9	9	18	10	8	18	8	9	17
29	190304013029	MR. AMAN RAJ VERMA	10	7	17	11	8	19	8	9	17	9	9	18	9	7	16
30	190304013030	MR. RISHABH TILAWDIYA	12	8	20	9	8	17	9	8	17	8	9	17	11	8	19
31	190304013032	MR. RAHUL MEWADA	7	7	14	8	9	17	9	8	17	8	8	16	8	8	16
32	190304013033	MR. NANDKISHORE	9	8	17	10	8	18	9	8	17	8	8	16	9	7	16
33	190304013034	MR. HAIDER QURESHI	8	8	16	8	8	16	7	8	15	7	8	15	10	8	18
34	190304013035	MR. KRISHNA KANT SONI	8	7	15	7	9	16	7	7	14	9	8	17	8	9	17
35	190304013037	MR. SUMIT TYAGI	9	7	16	10	9	19	8	7	15	9	9	18	10	7	17
36	190304013038	MR. BHARAT PATIDAR	10	7	17	9	9	18	10	8	18	11	8	19	7	7	14
37	190304013039	MR. ANAND MALVIYA	7	7	14	10	8	18	7	8	15	10	7	17	8	8	16
38	190304013040	MR. RAVINDRA PARMAR	10	7	17	10	9	19	10	9	19	11	9	20	9	8	17
39	190304013042	MR. JASPAL THAKUR	11	7	18	9	9	18	10	8	18	9	9	18	11	7	18
40	190304013043	MR. KRISHNA MALVIYA	11	7	18	10	9	19	10	9	19	10	9	19	10	8	18
41	190304013045	MR. SHARUK MANSURI	11	8	19	10	9	19	10	8	18	9	7	16	8	8	16
42	190304013046	MR. RAVI PRATAP MEWADA	9	9	18	10	9	19	7	9	16	9	8	17	7	8	15
43	190304013047	MR. JITENDRA SINGH SISODIYA	12	8	20	8	9	17	10	9	19	8	9	17	8	7	15
44	190304013048	MR. AMAN VERMA	10	7	17	8	9	17	10	7	17	10	7	17	10	8	18
45	190304013049	MR. PAWAN PATIDAR	11	8	19	7	8	15	9	7	16	8	8	16	9	7	16
46	190304013050	MR. PRADUMN PATIDAR	12	9	21	7	9	16	10	8	18	10	8	18	11	8	19

47	190304013051	MRS. SHEFULLAH KHAN	7	8	15	9	10	19	9	8	17	10	9	19	10	8	18
48	190304013052	MR. FARHAN AHMAD	9	7	16	8	9	17	7	8	15	8	9	17	8	8	16
49	190304013053	MR. UBEDULLA KHAN	9	8	17	9	9	18	9	7	16	9	8	17	10	8	18
50	190304013054	MR. ARIF KHAN	9	9	18	9	8	17	7	8	15	8	8	16	8	8	16
51	190304013055	MR. AKIL KHAN	9	8	17	9	9	18	10	9	19	9	8	17	9	7	16
52	190304013056	MR. AMAN KHAN	12	7	19	10	8	18	10	9	19	11	8	19	9	7	16
53	190304013057	MR. FARUK KHAN	10	8	18	6	10	16	7	8	15	8	9	17	10	9	19
54	190304013058	MR. KHALID KHAN	8	9	17	7	8	15	8	8	16	9	8	17	9	9	18
55	190304013059	MR. SOHAIL KHAN	11	8	19	9	7	16	14	8	22	9	9	18	12	9	21
56	190304013061	MR. SACHINENDRA KUMAR	10	5	15	8	9	17	10	9	19	9	9	18	12	8	20
57	190304013062	MR. VIKASH YADAV	9	8	17	8	9	17	10	9	19	8	9	17	8	9	17
58	190304013063	MR. SANDEEP PRAJAPATI	8	8	16	8	8	16	10	8	18	9	7	16	9	9	18
59	190304013064	MR. ABHISHEK KUMAR	10	7	17	7	9	16	7	9	16	9	8	17	9	9	18
60	190304013065	MR. VIRENDRA THAKUR	9	7	16	9	9	18	9	7	16	9	9	18	10	8	18
61	190304013066	MR. PRABHAT KUMAR	10	7	17	9	7	16	10	9	19	9	7	16	10	9	19
62	190304013067	MR. ADIL	11	8	19	9	8	17	8	8	16	8	8	16	9	8	17
63	190304013068	MR. DINESH KUMAR YADAV	8	7	15	7	9	16	7	9	16	8	10	18	8	7	15
64	190304013069	MR. ANKIT SHARMA	7	7	14	9	9	18	9	8	17	9	9	18	10	9	19
65	190304013070	MISS. FATIMA SHAMIM	10	8	18	9	9	18	10	8	18	10	8	18	10	8	18
66	190304013071	MR. NIRMAL CHANDRAVANSHI	10	7	17	10	9	19	7	8	15	11	9	20	9	9	18
67	190304013072	MR. DHARMENDRA CHOUHAN	9	8	17	11	8	19	8	7	15	10	8	18	11	8	19
68	190304013076	MR. NAIEM KHAN	13	8	21	7	9	16	8	9	17	9	7	16	10	8	18

69	190304013077	MS. DEEPIKA	12	7	19	9	8	17	10	10	20	9	8	17	9	7	16
70	190304013078	MR. MHD SAALIM	11	8	19	9	9	18	10	9	19	9	9	18	11	8	19
71	190304013079	MS. SHIVANI LODHI	8	7	15	9	8	17	9	9	18	11	7	18	8	8	16
72	190304013082	MR. SANTOSH KUMAR	9	7	16	8	9	17	7	8	15	10	8	18	10	9	19
73	190304013083	MRS. SAIMA ANWAR KHAN	7	9	16	9	8	17	8	9	17	7	9	16	14	8	22
74	190304013084	GANESH	12	8	20	7	10	17	8	9	17	8	9	17	8	7	15
75	190304013085	MR. PATEL MEETKUMAR	7	7	14	8	8	16	7	8	15	7	8	15	8	8	16
76	190304013086	MR. PATEL NEHANGKUMAR	7	7	14	8	8	16	8	9	17	7	9	16	9	9	18
77	190304013087	MS. SHAIKH NEHA FIROZ	10	8	18	10	8	18	10	9	19	8	8	16	10	8	18
78	190304013089	MR. ABHISHEK VARSAIYA	9	8	17	9	7	16	7	7	14	10	8	18	7	8	15
79	190304013090	MR. YASIR KHAN	7	8	15	8	8	16	8	9	17	7	8	15	10	9	19
80	190304013091	MS. ZEBA ROKSHAR	8	7	15	7	7	14	9	7	16	7	8	15	11	8	19
81	190304013092	MISS. NITU KUMARI	7	7	14	8	7	15	7	9	16	10	9	19	10	7	17
82	190304013093	MR. ABDUL MAJID	8	9	17	7	9	16	8	8	16	10	9	19	7	8	15
83	190304013094	MR. JALAJ VISHVKARMA	13	7	20	10	8	18	9	8	17	9	9	18	8	7	15
84	190304013096	MR. RITESH KUNAR KUSHWAHA	9	7	16	8	9	17	8	9	17	9	8	17	7	7	14
85	190304013097	Mr. SANJAY PATHARIYA	11	8	19	9	8	17	7	9	16	8	9	17	9	7	16
86	190304013098	MR. SHYAM LAL MEWADA	11	9	20	8	9	17	11	8	19	12	9	21	11	8	19
87	190304013099	MR. UDAY BHIKA MAHAJAN	8	7	15	7	8	15	7	7	14	10	9	19	7	7	14
88	190304013100	MR. RAMKRIPAL	7	8	15	9	9	18	8	8	16	8	8	16	7	8	15
89	190304015003	MR. SHAIKH NOOR AALAM	10	8	18	10	8	18	10	9	19	8	8	16	10	8	18
90	200304015001	MR. VIDHYA BHUSHAN PANDEY	8	9	17	8	9	17	10	7	17	9	9	18	10	8	18

91	200304015002	MR. BHUPENDER	10	8	18	9	9	18	11	8	19	10	8	18	12	7	19
92	200304015003	MR. SHYAM KUMAR KANNAUJIYA	7	8	15	9	8	17	8	7	15	9	9	18	10	7	17
93	200304015004	MR. KISHOR GOURICHAND MHASKE	8	7	15	7	7	14	10	8	18	10	7	17	10	8	18
94	200304015006	MR. AKSHAY SHANTARAM CHAVAN	8	8	16	9	8	17	9	9	18	8	8	16	9	8	17
95	200304015007	MR. RAHUL ROY	7	7	14	7	8	15	7	8	15	9	7	16	10	7	17
96	200304015009	MR. CHAUDHARI RAVSAHEB NARAYAN	7	7	14	8	9	17	9	9	18	10	9	19	10	8	18
97	200304015010	MR. CHAUDHARI BHUSHAN PANDIT	8	8	16	7	8	15	8	8	16	9	7	16	9	7	16

S.M.* SESSIONAL MARKS

C.M.* CONTINEOUS MODE

DEAN

Dean
School of Pharmacy
Sri Satya Sai University of Technology
and Medical Sciences, Sehore (M.P.)

SCHOOL OF PHARMACY

Sri Satya Sai University of Technology and Medical Science, Sehore

B. Pharm VII sem Internal Assessment (Theory & Practical Exam) Marks (Dec-2021)

S.N.	Roll/Enroll No.	Name of Student	BP 701			BP 702			BP 703			BP 704			BP 701(PRACTICAL)		
			SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL	SM	CM	TOTAL
1	1603241031	SABIR MANSURI	8	8	16	7	9	16	7	8	15	9	7	16	9	5	14
2	1603241050	SUNIL KUMAR VERMA	7	8	15	8	9	17	7	8	15	8	8	16	8	4	12
3	1603241072	AAZAD MEWADA	7	8	15	7	9	16	8	9	17	8	9	17	9	4	13
4	1603241008	PRADEEP	8	9	17	8	8	16	8	9	17	8	9	17	7	4	11
5	1703241040	GOURAV MEWADA	8	7	15	8	7	15	8	7	15	8	8	16	8	4	12
6	1703241073	ROHIT AMRATIYA	9	8	17	8	8	16	8	9	17	7	9	16	8	5	13
7	1703241080	DEEPAK BANWARI	8	9	17	7	8	15	7	8	15	8	8	16	9	5	14
8	1703241083	VIKAS SOLANKI	9	9	18	7	9	16	7	8	15	7	8	15	9	4	13
9	1703241101	DEEPANSHU PAINGORIYA	10	9	19	8	8	16	8	7	15	8	7	15	8	3	11
10	1708101008	RACHNA DANGI	10	8	18	7	8	15	7	8	15	8	8	16	8	4	12
11	1808101001	DEVENDRA LOVEVANSHI	8	8	16	8	7	15	7	8	15	7	8	15	7	4	11
12	1808101002	ARVIND MEWADA	7	8	15	7	9	16	8	8	16	8	8	16	8	4	12

3	1808101003	CHINMOY BERA	10	9	**19**	11	9	**20**	10	7	**17**	11	7	**18**	8	2	10
14	1808101004	ANIL MEWADA	11	8	**19**	11	7	**18**	9	8	**17**	11	8	**19**	7	4	11
15	1808101005	ANUBHAV YASHAB MASIH	8	8	**16**	8	8	**16**	7	9	**16**	8	9	**17**	9	3	12
16	1808101006	LOKESH YADAV	10	9	**19**	9	9	**18**	8	7	**15**	7	7	**14**	9	5	14
17	1808101008	SHUBHAM SEN	8	8	**16**	9	7	**16**	8	8	**16**	8	8	**16**	8	5	13
18	1808101009	PINKI SINGH	8	7	**15**	7	9	**16**	8	9	**17**	9	9	**18**	8	3	11
19	1808101010	YASHPAL YADAV	7	8	**15**	8	8	**16**	8	9	**17**	8	9	**17**	9	5	14
20	1808101011	ROHIT YADAV	9	8	**17**	10	8	**18**	9	9	**18**	10	9	**19**	7	2	9
21	1808101012	ABHISHEK YADAV	10	8	**18**	11	8	**19**	10	9	**19**	12	9	**21**	9	3	12
22	1808101013	RONAK BHAWSAR	8	9	**17**	8	8	**16**	8	9	**17**	8	9	**17**	7	4	11
23	1808101014	AKASH DHAKAD	12	8	**20**	9	9	**18**	8	7	**15**	10	7	**17**	8	4	12
24	1808101018	SAKEEL SHAH	10	8	**18**	8	9	**17**	8	8	**16**	9	8	**17**	8	4	12
25	1808101019	SANJAY PRAJAPATI	8	9	**17**	7	9	**16**	6	7	**13**	8	7	**15**	9	4	13
26	1808101020	BEJNATH SAHANI	7	8	**15**	8	8	**16**	7	9	**16**	7	9	**16**	7	3	10

7	1808101023	SURESH MALVIYA	10	8	**18**	7	8	**15**	9	9	**18**	10	9	**19**	8	4	12
28	1808101024	PREETAM KALMODIYA	8	8	**16**	7	9	**16**	7	8	**15**	8	8	**16**	8	3	11
29	1808101026	SATYAM VERMA	10	8	**18**	8	8	**16**	8	7	**15**	11	7	**18**	9	5	14
30	1808101027	SAHIL RATHORE	9	8	**17**	11	8	**19**	9	9	**18**	11	9	**20**	8	5	13
31	1808101028	SACHIN MECHAN	8	9	**17**	8	9	**17**	8	7	**15**	8	7	**15**	7	3	10
32	1808101029	CHETAN MAHESHWARI	10	8	**18**	9	7	**16**	8	8	**16**	11	8	**19**	8	3	11
33	1808101030	DANISH KHAN	7	7	**14**	8	9	**17**	8	9	**17**	7	9	**16**	9	4	13
34	1808101031	REHAN KHAN	8	9	**17**	10	7	**17**	7	8	**15**	8	8	**16**	9	5	14
35	1808101032	MALEK MOIN	10	9	**19**	11	9	**20**	8	9	**17**	10	9	**19**	8	3	11
36	1808101033	VIKAS PARMAR	10	8	**18**	10	8	**18**	8	8	**16**	11	8	**19**	9	5	14
37	1808101034	PAVAN PARMAR	11	9	**20**	10	9	**19**	9	8	**17**	11	8	**19**	8	4	12
38	1808101035	HEMANT PAWAR	10	9	**19**	10	8	**18**	9	9	**18**	10	9	**19**	8	4	12
39	1808101036	SARANSH GUPTA	8	8	**16**	8	9	**17**	7	8	**15**	8	7	**15**	8	5	13
40	1808101037	SAJAL JANA	9	9	**18**	10	8	**18**	9	9	**18**	11	9	**20**	8	2	10

1	1808101039	SARFRAZ MANSURI	10	8	**18**	11	8	**19**	8	9	**17**	8	9	**17**	7	3	10
42	1808101040	NAEEM SHAH	8	9	**17**	7	9	**16**	7	7	**14**	7	7	**14**	7	3	10
43	1808101041	YASH GUPTA	9	8	**17**	8	7	**15**	8	8	**16**	8	8	**16**	8	5	13
44	1808101042	DIPENDRA THAKUR	8	7	**15**	7	9	**16**	8	9	**17**	7	9	**16**	7	2	9
45	1808101043	SANDEEP AHIRWAR	8	8	**16**	9	8	**17**	7	8	**15**	10	8	**18**	7	5	12
46	1808101045	AKHLAK KHAN	8	8	**16**	8	8	**16**	8	7	**15**	8	7	**15**	8	3	11
47	1808101046	GULFAN KHAN	10	9	**19**	11	9	**20**	9	7	**16**	9	7	**16**	7	5	12
48	1808101047	DHARAM MEWADA	9	8	**17**	10	8	**18**	8	9	**17**	10	9	**19**	8	4	12
49	1808101048	SHAILENDRA JALVAYA	8	9	**17**	9	9	**18**	7	7	**14**	8	7	**15**	8	4	12
50	1808101049	ANKIT SURYAWANSHI	11	9	**20**	11	9	**20**	9	8	**17**	11	8	**19**	8	5	13
51	1808101050	AKHILESH KUMAR MISHRA	8	7	**15**	8	9	**17**	8	9	**17**	8	9	**17**	7	2	9
52	1808101051	MURSLIN KHAN	11	8	**19**	8	8	**16**	7	9	**16**	7	9	**16**	9	3	12
53	1808101053	FAHIM	11	9	**20**	7	9	**16**	8	8	**16**	8	8	**16**	8	3	11
54	1808101054	DEEPAK CHOUDHARY	8	9	**17**	8	8	**16**	8	9	**17**	8	9	**17**	9	5	14

5	1808101056	SHUBHAM MANORIYA	10	8	**18**	9	9	**18**	8	7	**15**	10	7	**17**	7	4	11
56	1808101057	MOHD SAIF ALI	10	9	**19**	10	8	**18**	10	9	**19**	11	9	**20**	8	4	12
57	1808101058	NEERAJLODHI	9	8	**17**	11	8	**19**	9	9	**18**	11	9	**20**	8	3	11
58	1808101059	HEMANT NAGAR	9	8	**17**	8	7	**15**	8	8	**16**	10	8	**18**	8	5	13
59	1808101060	DEVENDRA PANWAR	10	7	**17**	10	9	**19**	10	9	**19**	11	9	**20**	8	2	10
60	1808101062	AJAY PRAJAPATI	8	8	**16**	7	8	**15**	7	9	**16**	8	9	**17**	7	2	9
61	1808101063	ABHISHEK VISHAWKARMA	11	8	**19**	10	8	**18**	10	9	**19**	11	9	**20**	9	3	12
62	1808101064	TARUN PANWAR	9	8	**17**	10	8	**18**	10	8	**18**	11	8	**19**	9	5	14
63	1808101065	SHEETAL PARMAR	8	8	**16**	10	8	**18**	7	7	**14**	8	7	**15**	9	4	13
64	1808101067	MOHAMMAD ZAID	8	8	**16**	10	8	**18**	7	9	**16**	7	9	**16**	9	4	13
65	1808101068	SHUBHAM VERMA	8	8	**16**	9	8	**17**	8	9	**17**	8	9	**17**	7	4	11
66	1808101069	OMPRAKASH RATHORE	9	8	**17**	8	9	**17**	8	8	**16**	7	8	**15**	8	5	13
67	1808101070	ANKIT PARMAR	11	9	**20**	10	7	**17**	9	8	**17**	10	8	**18**	9	5	14
68	1808101071	ARSHAD MEV	9	8	**17**	8	8	**16**	8	7	**15**	7	8	**15**	8	3	11

69	1808101072	SHAGUFATA KHAN	8	8	**16**	8	8	**16**	8	9	**17**	7	9	**16**	9	5	14
70	1808101073	DEVENDRA KUSHWAHA	8	8	**16**	8	8	**16**	8	9	**17**	8	9	**17**	7	4	11
71	1808101074	RAVI KUMBHKAR	9	8	**17**	9	8	**17**	9	9	**18**	11	9	**20**	8	4	12
72	1808101075	ROHIT GAUR	9	9	**18**	9	9	**18**	8	9	**17**	8	9	**17**	8	5	13
73	1808101078	GOVID VINAY	8	9	**17**	9	9	**18**	8	8	**16**	7	8	**15**	9	5	14
74	1808101080	SURENDRA PATIDAR	8	9	**17**	11	8	**19**	8	9	**17**	8	9	**17**	8	3	11
75	1808101081	DEEPAK	9	8	**17**	10	8	**18**	9	9	**18**	11	9	**20**	9	3	12
76	1808101082	MUSKAN KHUSWAH	8	8	**16**	9	8	**17**	8	7	**15**	7	8	**15**	8	5	13
77	1808101084	SANNOBEE	9	9	**18**	7	8	**15**	8	9	**17**	7	9	**16**	9	2	11
78	1808101087	JAYRAM	10	8	**18**	11	8	**19**	10	9	**19**	10	9	**19**	9	5	14
79	1808101088	PAWAN MEWADA	9	8	**17**	9	8	**17**	8	9	**17**	10	9	**19**	8	3	11
80	1808101090	ASHOK KUMAR	8	9	**17**	9	9	**18**	8	7	**15**	7	8	**15**	9	5	14
81	1808101091	ADITYA SHARMA	8	8	**16**	11	7	**18**	7	8	**15**	8	8	**16**	8	4	12
82	1808101092	RAJAT DANGI	8	7	**15**	9	9	**18**	8	9	**17**	7	9	**16**	7	4	11

83	1808101093	HEMANT	11	8	**19**	9	8	**17**	9	8	**17**	9	8	**17**	8	4	12
84	1808101094	SUNIL KUMAR RAI	8	9	**17**	7	9	**16**	8	8	**16**	7	8	**15**	9	4	13
85	1808101097	AYUSH NAGAR	9	8	**17**	8	8	**16**	7	8	**15**	7	8	**15**	9	3	12
86	1808101098	SHUBHAM DANGI	8	8	**16**	9	8	**17**	9	7	**16**	10	7	**17**	8	3	11
87	1808101100	OMPRAKASH DANGI	9	8	**17**	8	8	**16**	8	9	**17**	7	9	**16**	9	5	14
88	190304015001	CHETAN JIVAN AJMERE	7	9	**16**	7	8	**15**	7	8	**15**	7	8	**15**	8	5	13
89	190304015002	ASHWIN BHAWSAR	10	9	**19**	8	8	**16**	8	7	**15**	7	8	**15**	8	4	12

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SEHORE

Date :-20/09/21

NOTICE

REMEDIAL CLASSES

IIIrd, Vth & VIIth Semester B.Pharma Students

All the students of IIIrd, Vth & VIIth of B.Pharma, who failed to secure good marks in theory courses are hereby informed that, the remedial classes for the courses of III ,V & VII semester have been identified based on poor performance of students in Ist sessional examination.

The remedial classes for the identified courses will be beneficial for the students appearing in next sessional exam to be held on November 2021.

class	Name of course	Course code	No. of student	Name of course Teacher
VII	Instrumental Method of Analysis	BP 701	07	Dr Harshad Kothawade
VII	Industrial Pharmacy-II	BP 702	17	Mr Brijendra Patel
VII	Pharmacy Practice	BP 703	21	DR Jagdish Pati
V	Medicinal chemistry	BP 501	15	Mr Pradeep Patra
V	Industrial Pharmacy-I	BP 502	14	Mr Yogendra Malviya
III	Physical pharmaceutics-i	BP 302	15	Mr Ankit Prajapati
III	Pharmaceutical Engg	BP 304	19	Ms Nidhi Jain

Therefore,the concerned course teachers are kindly requested to conduct the remedial classes as per schedule attached with this notice.

Prof Dr Amol Pachpute

Remedial class Coordinator

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SEHORE

Date :-20/09/21

NOTICE

REMEDIAL CLASSES

IIIrd, Vth & VIIth Semester B.Pharma Students

All the students of IIIrd, Vth & VII$^{th of}$ B.Pharma, who failed to secure good marks in theory courses are hereby informed that, the remedial classes for the courses of III ,V & VII semester have been scheduled to be conducted during 8th to 22nd October 2021 for the improvement and preparation of sessional Exam.

The schedule of the remedial classes is as given below:

Class	Time									
		Sub	Faculty	Venue	Sub	Faculty	Venue	Sub	Faculty	Venue
VII	10:00AM TO 12:00 PM	BP 701	HK	G-10	BP 702	BP	G-10	BP 703	JP	G-10
VII	01:00PM TO 03:00 PM	BP 702	BP	G-10	BP 703	JP	G-10	BP 701	HK	G-10
VII	03:30AM TO 05:00 PM	BP 703	JP	G-10	BP 701	HK	G-10	BP 702	BP	G-10
V	10:00AM TO 12:00 PM	BP 501	PP	G-1	BP 502	YM	G-1	BP 501	PP	G-1
V	01:00PM TO 03:00 PM	BP 502	YM	G-1	BP 501	PP	G-1	BP 502	YM	G-1
III	10:00AM TO 12:00 PM	BP 302	AP	F-1	BP 304	NJ	F-1	BP 302	AP	F-1
III	01:00PM TO 03:00 PM	BP 304	NJ	F-1	BP 302	AP	F-1	BP 304	NJ	F-1

Prof Dr Amol Pachpute
Remedial class Coordinator

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SEHORE

ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Physical Pharmaceutics -I (BP302) CLASS: B. Pharmacy (2nd yr)

CADEMIC YEAR: 2021-2022 SEMESTER: III

DATE:- 09/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1.	190304013019	Sharavan	Shravan
2	190304013031	Saurabh Rautel	Saurabh
3	190304013036	Musharraf Shah	[illegible]
4	200304013002	Ajay kumar Singh	Ajay Kumar Singh
5	200304013004	Pratipal Singh thakur	[illegible]
6	200304013012	Rakesh Dhakad	Rakesh
7	200304013021	Pooja Sharma	Sharma
8	200304013023	Amay Dasondi	Amay
9	200304013029	Vaibhav Prajapati	Vaibhav
10	200304013034	Jaher khan	JK
11	200304013037	Devraj Patidar	[illegible]
12	200304013041	Ronit Raghuvanshi	Ronit
13	200304013052	Ravi Vishwakarma	Ravi
14	200304013054	Shakeel khan	Skhan
15	200304013058	Ankush Bhavsar	Ankush

No of students:- 15
No.of students registered:- 15
Signature of course instructor: Ankit
Mr. Ankit Prajapati

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Physical Pharmaceutics-I (BP-302) CLASS: B. Pharmacy (2nd yr)

CADEMIC YEAR: 2021-2022 SEMESTER: III

DATE:- 16/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1	19030401 3019	Sharavan	Sharavan
2	19030401 3031	Saurabh Rautel	Saurabh
3	19030401 3036	Musharraf Shah	[illegible]
4	20030401 3002	Ajay Kumar Singh	Ajay Kumar Singh
5	20030401 3004	Prithipal Singh Thakur	[illegible]
6	20030401 3012	Rakesh Dhakad	Rakesh
7	20030401 3021	Pooja Sharma	Sharma
8	20030401 3023	Anay Dasondi	Amay
9	20030401 3029	Vaibhav Prajapat	Vaibhav
10	20030401 3034	Jahir Khan	[illegible]
11	20030401 3037	Devraj Patidar	[illegible]
12	20030401 3041	Rohit Raghuvanshi	Rohit
13	20030401 3052	Ravi Vishwakarma	Ravi
14	20030401 3054	Shakeel Khan	Skhan
15	20030401 3058	Ankush Bhavsar	Ankush

No of students:- 15

No.of students registered:- 15

Signature of course instructor:- Ankit
Mr. Ankit Prajapati

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Physical Pharmaceutics – I (BP-302) CLASS: B. Pharmacy (2nd year)

CADEMIC YEAR: 2021-2022 SEMESTER: III

DATE:- 23/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013019	Sharavan	Saravan
2	190304013031	Saurabh Patel	Saurabh
3	190304013036	Musharraf Shah	
4	200304013002	Ajay kumar Singh	Ajay kumar Singh
5	200304013004	Pradeep Singh Thakur	
6	200304013012	Rakesh Dhakad	Rakesh
7	200304013021	Pooja Sharma	Sharma
8	200304013023	Anay Darondi	Anay
9	200304013029	Vaibhav Prajapat	Vaibhav
10	200304013034	Jahir khan	JK
11	200304013037	Devraj Patidar	Dpa
12	200304013041	Romit Raghuvanshi	Romit
13	200304013052	Ravi Vishwakarma	Ravi
14	200304013054	Shakeel Khan	SKhan
15	200304013058	Ankush Bhavsar	Ankush

No of students:- 15

No.of students registered:- 15

Signature of course instructor:- Mr. Ankit Prajapati

Ankit

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Pharmaceutical Engg [BP(304)] CLASS: B.Pharmacy (2nd Year,

CADEMIC YEAR: 2021 - 2022 SEMESTER: III

DATE:- 09/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013036	Musharraf Shah	[signature]
2	190304013081	Rajeshwari Gour	Rajeshwari
3	200304013006	Raj Manngal singh	Raj mangal singh
4	200304013022	Rakesh Dhokad	Rakesh
5	200304013031	Anjoo singh	[signature]
6	200304013034	Jahir Khan	JK
7	200304013037	Devraj Patidar	[signature]
8	200304013049	Bhupendra Mewada	Bhupendra
9	200304013051	Toshikh Khan	Toshikh
10	200304013054	Shakeel khan	S Khan
11	200304013063	Khalid Khan	Khalid Khan
12	200304013065	Virat singh	Virat
13	200304013068	Kavita Yadav	Kavita
14	200304013072	Aadarsh Patidar	Aadarsh
15	200304013087	Anshul Agrawal	anshul
16	200304013091	Deepak Meena	Deepak
17	200304013097	Irfan	Irfan
18	200304013098	Harshit kumar Gupta	Harshit
19	200304013100	Nikhil Mewada	Nikhil

No of students:- 19
No.of students registered:- 19
Signature of course instructor:- Jain Ms. Nidhi Jain

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Pharmaceutical Engg [BP(304)] CLASS: B.Pharmacy (2nd Yea

CADEMIC YEAR: 2021-2022 SEMESTER: III

DATE:- 16/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1	1903040013036	Musharraf Shah	
2	1903040013081	Rajeshwari Gour	Rajeshwari
3	2003040013006	Raj Manngal Sing	Raj mangal Singh.
4	20030401301̶2	Rakesh Dhakad	Rakesh
5	2003040013031	Anjoo singh	
6	2003040013034	Jahir Khan	
7	2003040013037	Devraj Patidar	
8	2003040013049	Bhupendra Mewada	Bhupendra
9	2003040013051	Toshiph Khan	Toshiph
10	2003040013054	Shakeel khan	S.khan
11	20030401301̶6̶	Khalid Khan	Khalid Khan
12	2003040013065	Virat singh	Virat
13	2003040013068	Kavita Yadav	Kavita
14	2003040013072	Aadarsh Patidar	Aadarsh
15	2003040013087	Anshul Agrawal	anshul
16	2003040013091	Deepak Meena	Deepak
17	2003040013097	Irfan	Irfan
18	2003040013098	Harshit Kumar Gupta	Harshit
19	2003040013100	Nikhil Mewada	Nikhil

No of students:- 19

No.of students registered:- 19

Signature of course instructor:- Jain Ms. Nidhi jain

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Pharmaceutical Engg (BP(304)) CLASS: B. Pharmacy (2nd y

CADEMIC YEAR: 2021 – 2022

SEMESTER: III

DATE:- 23/10/21

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013036	Musharraf Shah	Ahass
2	190304013081	Rajeshwari Gaur	Rajeshwari
3	200304013006	Raj Manngal singh	Rajmangalsingh
4	200304013012	Rakesh Dhakad	Rakesh
5	200304013031	Anjoo singh	A
6	200304013034	Jahir Khan	JK
7	200304013037	Devraj Patidar	Dpa
8	200304013049	Bhupendra Mewada	Bhupendra
9	200304013051	Toshibh Khan	Toshibb
10	200304013054	Shakeel Khan	SKhan
11	200304013063	Khalid Khan	Khalid Khano
12	200304013065	Virat Singh	Virat
13	200304013068	Kavita Yadav.	Kavita
14	200304013072	Aadarsh Patidar	Aadarsh
15	200304013087	Anshul Agrawal	anshul
16	200304013091	Deepak Meena	Deepak
17	200304013097	Irfan	Irfan
18	200304013098	Harshit Kumar Gupta	Harshit
19	200304013100	Nikhil Mewada	Nikhil

No of students:- 19

No.of students registered:- 19

Signature of course instructor:- Jain Ms. Nidhi Jain

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Medicinal chemistry (BP-501) CLASS: B.Pharmacy (3rd yea

CADEMIC YEAR: 2021-2022 SEMESTER: V

DATE:- 09/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013001	Shiv Kumar Jaiswal	
2	190304013004	Mukesh Bhura	Bhura
3	190304013032	Rahul Mewada	Rahul
4	190304013039	Anand Malviya	Anand
5	190304013051	shefullah Khan	Shefulla
6	190304013069	Ankit sharma	Ankit
7	190304013083	Saima Anwar Khan	Saima
8	190304013085	Patel Meetkumar	Meet
9	190304013086	Patel Nehangkumar	Nkumar
10	190304013090	Yasir Khan	Yasir
11	190304013092	Nitu Kumari	Nitu
12	190304013100	Ramkripal	Ramk
13	200304015003	shyam Kumar Kannaujiya	Sham
14	200304015007	Rahul Ray	RR
15	200304015010	chaudhari Ravsheb Narayan	Ravsheb

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No of students:- 15

No.of students registered:- 15

Signature of course instructor:- Mr. Pradeep patra

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Medicinal chemistry (BP-501) CLASS: B.pharmacy (3rd y

CADEMIC YEAR: 2021 - 2022 SEMESTER: V

DATE:- 16/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013001	Shiv Kumar Jaiswal	
2	190304013004	Mukesh Bhura	MBhura
3	190304013032	Rahul Mewada	Rahul
4	190304013039	Anand Malviya	Anand
5	190304013051	Shefullah Khan	Shefulla
6	190304013069	Ankit sharma	Ankit
7	190304013083	Saima Anwar Khan	Saima
8	190304013085	patel Meetkumar	Rmeet
9	190304013086	Patel Nehangkumar	NKumar
10	190304013090	Yasir Khan	Yasir
11	190304013092	Nitu Kumari	Nitu
12	190304013100	Ram Kripal	Ramk
13	200304015003	Shyam Kumar Kannaujiya	Shyam
14	200304015007	Rahul Ray	RR
15	200304015010	chaudhari Ravsheb Narayan.	Ravsheb

No of students:- 15
No.of students registered:- 15
Signature of course instructor:- Mr. Pradeep Patra

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SEHORE

ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Medicinal chemistry-(Bp-501) CLASS: B.Pharmacy 3rd year

CADEMIC YEAR: 2021-2022 SEMESTER: V

DATE:- 23/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013001	Shiv Kumar Jaiswal	
2	190304013004	Mukesh Bhura	Mukesh
3	190304013032	Rahul Mewada	Rahul
4	190304013039	Anand Malviya	Anand
5	190304013051	Shefullah Khan	Shefulla
6	190304013069	Ankit Sharma	Ankit
7	190304013083	Saima Anwar Khan	Saima
8	190304013085	Patel Meetkumar	Pmeet
9	190304013086	Patel Nehangkumar	NKumar
10	190304013090	Yasir Khan	Yasir
11	190304013092	Nitu Kumari	Nitu
12	190304013100	Ram Kripal	Ramk
13	200304015003	Shyam Kumar Kannavjiya	Sham
14	200304015007	Rahul Roy	RR
15	200304015010	Chaudhari Ravsheb Narayan	Rashab

No of students:- 15
No.of students registered:- 15
Signature of course instructor: Mr. Pradeep patra

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial Pharmacy - I (BP-502) CLASS: B.Pharmacy (3rd year)

ACADEMIC YEAR: 2021-2022 SEMESTER: V

DATE:- 9/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	190304013014	Yash Mukati	Yash
2.	190304013049	Pawan patidar	Pawan
3.	190304013050	Pradumm patidar	Pradyum.
4.	190304013058	Khalid Khan	Khalid
5.	190304013064	Abhishek Kumar	Abhishek
6.	190304013068	Dinesh Kumar yadav	Dinesh Kumar
7.	190304013076	Naiem Khan	naiem M.
8.	190304013084	Ganesh	ganesh
9.	190304013097	zeba Rokshar	Zeba
10.	190304013095	Abdul Majid	Abdul
11.	190304013099	uday Bhika Mahajan	uday Bhika
12.	200304015004	Kishor Gourichand Mhaske	Kishor
13.	200304015007	Rahul Roy	Rahul.
14.	200304015010	chaudhari Bhushan pandit	Chaudhari

No of students:- 14

No.of students registered:- 14

Signature of course instructor:- Mr. Yogendra Malviya

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial pharmacy-I (BP-502) CLASS: B.Pharmacy (3rd Yea

CADEMIC YEAR: 2021 - 2022 SEMESTER: VI

DATE:- 16/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1	190304013014	Yash Mukati	Yash
2	190304013049	Pawan patidar	Pawan
3	190304013050	Pradumn patidar	Pradumn
4	190304013058	Khalid Khan	Khalid
5	190304013064	Abhishek Kumar	Abhishek
6	190304013068	Dinesh Kumar Yadav	Dinesh Kumar
7	190304013076	Naiem Khan	Naiem.
8	190304013084	Ganesh	ganesh
9.	190304013091	Zeba Rokshar	Zeba
10	190304013093	Abdul Majid	Abdul
11	190304013099	Uday Bhika Mahajan	Uday Bhika
12	200304015004	Kishor Gourichand Mhaske	Kishor
13	200304015007	Rahul Roy	Rahul.
14	200304015010	Chaudhari Bhushan pandit	Chaudhari

No of students:- 14

No.of students registered:- 14

Signature of course instructor:- Ymalviya Yogendra Malviya

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial Pharmacy-I (BP-502) CLASS: B.Pharmacy (3rd year

CADEMIC YEAR: 2021-2022 SEMESTER: V

DATE:- 23/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	190304013014	Yash Mukati	Yash
2.	190304013049	Pawan Patidar	Pawan
3.	190304013050	Pradumn Patidar	Pradumn
4.	190304013058	Khalid Khan	Khalid
5.	190304013064	Abhishek Kumar	Abhishek
6.	190304013068	Dinesh Kumar Yadav	Dinesh Kumar
7.	190304013076	Naiem Khan	Naiem
8.	190304013084	Ganesh	Ganesh
9.	190304013091	Zeba Rokshar	Zeba
10.	190304013093	Abdul Majid	Abdul
11.	190304013099	Uday Bhika Mahajan	Uday Bhika
12.	200304015004	Kishor Gavrichand Mhaske	Kishor
13	200304015007	Rahul Roy	Rahul
14	200304015010	Chaudhari Bhushan Pandit	Chaudhari

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No of students:- 14

No.of students registered:- 14

Signature of course instructor:- Yogendra Malviya

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Instrumental Method of Analysis (BP-701) CLASS: B.pharmacy (4th YE

CADEMIC YEAR: 2021-2022 SEMESTER: VII

DATE:- 09/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241050	Sunil Kumar verma	Sunil Kumar
2	1603241072	Aazad Mewada	[signature]
3	1808101002	Arvind Mewada	Arvind
4	1808101010	Yashpal yadav	Yashpal Yadav
5	1808101020	Bejnath sahani	[signature]
6	1808101030	Danish khan	[signature]
7	19030401500l	Chetan Jivan Ajmera	Chetan

No of students:- 07
No.of students registered:- 07
Signature of course instructor:- Dr. Harshad Kothawadi Kothawade

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Instrumental Method of Analysis (BP-701)
CLASS: B.pharmacy (4th year)
CADEMIC YEAR: 2021-2022
SEMESTER: VII
DATE:- 16/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241050	Sonil kumar verma	Sunil kumar
2.	1603241072	Aazad mewada	[signature]
3.	1808101002	Arvind mewada	Arvind
4.	1808101010	Yashpal yadav	Yashpal yadav
5.	1808101020	Bejnath sahani	[signature]
6.	1808101030	Danish khan	[signature]
7.	1903040150001	chetan Jivan Ajmere	Chetan

No of students:- 07
No.of students registered:- 07
Signature of course instructor:- Dr. Harshad Kothawadi

Kothawade

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Instrumental Method of Analysis (BP-701) CLASS: B.pharmacy (4th Year

CADEMIC YEAR: 2021 - 2022 SEMESTER: VII

DATE:- 23/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241050	Sunil Kumar Verma	Sunil Kumar
2.	1603241072	Aazad Mewada	Azad
3.	1808101002	Arvind Mewada	Arvind
4.	1808101010	Yashpal Yadav	Yashpal Yadav
5.	1808101020	Bejnath Sahani	
6.	1808101030	Danish Khan	
7.	1903040150001	Chetan Jivan Ajmere	Chetan

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No of students:- 07
No.of students registered:- 07
Signature of course instructor:- Dr. Harshad Kothawade Kothawade

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial Pharmacy – II (Bp-702) CLASS: B.Pharmacy (4th Year)

CADEMIC YEAR: 2021 - 2022 SEMESTER: VII

DATE:- 09/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241031	Sabir Mansuri	S
2.	1603241072	Aazad Mewada	
3.	1703241080	Deepak Banwari	Deepak
4.	1703241083	Vikas Solanki	
5.	1708101008	Rachna Dangi	R
6.	1808101002	Arvind Mewada	Arvinder
7	1808101009	Pinki Singh	Pinki singh
8	1808101019	Sanjay Prajapati	Sanjay
9.	1808101023	Suresh Malviya	Suresh
10	1808101024	Preetam Kalmodiya	Preetam
11	1808101040	Naeem shah	
12	1808101042	Dipendra Thakur	Dipeendr
13	1808101053	Fahim	
14	1808101062	Ajay Prajapati	Ajay
15.	1808101084	Sammabee	Samy
16.	1808101094	Sunil Kumar Rai	Sunil
17.	190304015001	Chetan Jivan Ajmera	Chetan

No of students:- 17

No.of students registered:- 17

Signature of course instructor:- Mr. Brijendra patel

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial pharmacy-II (Bp-702) CLASS: B. pharmacy (4th year)

CADEMIC YEAR: 2021-2022 SEMESTER: VII

DATE:- 16/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241031	Sabir mansuri	
2.	1603241072	Aazad mewada	
3	1703241080	Deepak Banwari	Deepak
4.	1703241083	Vikas Solanki	
5.	1708101008	Rachna Dangi	
6.	1808101002	Arvind mewada	A mewada
7.	1808101009	Pinki singh	Pinki singh
8.	1808101019	Sanjay Prajapati	Sanjay
9.	1808101023	Suresh malviya	Suresh
10.	1808101024	Preetam kalmooliya	Preetam
11.	1808101040	Naeem shah	
12.	1808101042	Dipendra Thakur	Dipendra
13.	1808101053	Fahim	
14.	1808101062	Ajay Prajapati	Ajay
15.	1808101084	Sonnabee	
16.	1808101094	Sunil Kumar Rai	Sunil
17.	19030401015001	Chetan Jivan Ajmere	Chetan

No of students:- 17
No.of students registered:- 17
Signature of course instructor:- Mr. Brijendra patel

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Industrial Pharmacy – II (Bp-702) CLASS: B.Pharmacy (4th ye

CADEMIC YEAR: 2021 – 2022 SEMESTER: VII

DATE:- 23/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241051	Sabir Mansuri	S
2.	1603241072	Aazad Mewada	Aws
3.	1703241080	Deepak Banwari	Deepak.
4.	1703241083	Vikas Solanki	
5.	1708101008	Rachna Dangi	R
6.	1808101002	Arvind Mewada	A.mewada
7.	1808101009	Pinki Singh	Pinki Singh
8.	1808101019	Sanjay Prajapati	Sanjay
9.	1808101023	Suresh Malviya	Suresh
10	1808101024	Preetam Kalmodiya	Preetam
11.	1808101040	Naeem shah	
12.	1808101042	Dipendra Thakur	Dipendra
13	1808101053	Fahim	फहीम
14.	1808101062	Ajay Prajapati	Ajay
15.	1808101084	Sam8bee	Sams
16.	1808101094	Sunil Kumar Rai	Sunil
17.	1903d1015001	Chetan jivan Ajmere	Chetan

No of students:- 17

No.of students registered:- 17

Signature of course instructor:- Mr. Brijendra Patel Bpatel

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Pharmacy Practice (BP-703) CLASS: B.pharmacy (4th year)

CADEMIC YEAR: 2021-2022 SEMESTER: VII

DATE:- 09/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241031	Sabir Mansuri	S
2.	1603241050	Sunil Kumar verma	Sunil Kumar
3.	1703241080	Deepak Banwari	Deepak
4.	1703241083	Vikas Solanki	Vikash
5.	1708101008	Rachna Dangi	R
6.	1808101001	Devendra Lovevanshi	Devendra
7.	1808101005	Anubhav yashab Masib	Anubhav
8.	1808101019	Sanjay Prajapati	Sanjay
9.	1808101020	Bejanath Sahani	baijnath
10.	1808101024	Preetam Kalmodiya	Preetam
11.	1808101031	Rehan Khan	Rehan
12.	1808101036	Saransh Gupta	[illegible]
13.	1808101040	Naeem shah	Naeem Shah
14.	1808101043	Sandeep Ahirwar	Sandeep
15.	1808101048	Shailendra Jatvaya	Shailendra
16.	1808101051	Muslin Khan	Mussin
17.	1808101062	Ajay Prajapati	Ajay
18.	1808101065	Sheetal Parmar	Sheetal
19.	1808101067	Mohammad Zaid	Zaid
20.	1808101091	Aditya Sharma	Aditya
21.	1808101097	Ayush Nagar	[illegible]

No of students:- 21

No.of students registered:- 21

Signature of course instructor:- Dr. Jagdish pati Jagdish

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ATTENDANCE SHEET REMEDIAL CLASSES

COURSE NAME WITH CODE: Pharmacy Practice (BP-703) CLASS: B. Pharmacy (4th year)

CADEMIC YEAR: 2021-2022 SEMESTER: VII

DATE:- 23/10/2021

Sr No.	Enrollment no	Name of the student	Signature of student
1.	1603241031	Sabir Mansari	S
2.	1603241050	Sunil Kumar Verma	Sunil Kumar
3.	1703241080	Deepak Banwari	Deepak
4.	1703241083	Vikas Solanki	Vikash
5.	1708101008	Rachna Dangi	R
6.	1808101001	Devendra Lowevanshi	Devendra
7.	1808101005	Anubhav Yashab Masih	Amasi
8.	1808101019	Sanjay Prajapati	Sanjay
9.	1808101020	Bejnath Sahani	Baijnath
10.	1808101024	Preetam Kabrodiya	Preetam
11.	1808101031	Rehan Khan	Rehan
12.	1808101036	Saransh Gupta	Saransh
13.	1808101040	Naeem Shah	Naeem
14.	1808101043	Sandeep Ahirwar	Sahdeep
15.	1808101048	Shailendra Jatvaya	Shailendra
16	1808101051	Muslim Khan	Muslim
17.	1808101062	Ajay Prajapati	Ajay
18.	1808101065	Sheetal Parmar	Sheetalle
19.	1808101067	Mohammad Zaid	Zaid
20.	1808101091	Aditya Sharma	Aditya
21.	1808101097	Ayush Nagar	Ayus

No of students:- 21

No.of students registered:- 21

Signature of course instructor:- Dr. Jagdish pati Jagdish

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SEHORE

18/04/2022

NOTICE

REMEDIAL CLASSES

I[st] & III[rd] Semester B.Pharma Students

All the students of I[st] & III[rd] of B.Pharma, who failed in theory courses are hereby informed that, the remedial classes for the courses of I[st] & III[rd] semester have been identified based on poor performance of students in theory Examination.

The remedial classes for the identified courses will be beneficial for the students appearing in re-examination to be held on June 2022.

class	Name of course	Course code	No. of student	Name of course Teacher
I	PHARMACEUTICAL ANALYSIS - I	BP-102 [T]	12	Dr Harshad Kothawade
I	INORGANIC CHEMISTRY	BP-104 [T]	15	Mr Brijendra Patel
III	PHARMACEUTICAL ORGANIC CHEMISTRY - II	BP 301[T]	07	DR Jagdish Pati

Therefore,the concerned course teachers are kindly requested to conduct the remedial classes as per schedule attached with this notice.

Prof Dr Amol Pachpute
Remedial class Coordinator

Dean
SOP, SSSUTMS

Dean
School of Pharmacy
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SEHORE

Date: 18 April 2022

TIME TABLE FOR REMEDIAL CLASSES, June-2022

Sl no.	Course & Code	Date & Day	Time	No. of Students	Venue
1	PHARMACEUTICAL ANALYSIS – I (BP-102)	04/06/2021 To 25/06/2021	10:00- AM to 12:00PM	210304013001, 210304013013, 210304013014, 210304013022, 210304013026, 210304013029, 210304013042, 210304013057, 210304013061, 210304013072, 210304013078, 210304013083.	G-1
2	INORGANIC CHEMISTRY (BP-104)	04/06/2021 To 25/06/2021	1:00- PM to 3:00PM	210304013002, 210304013003, 210304013005, 210304013013, 210304013014, 210304013026, 210304013029, 210304013030, 210304013056, 210304013062, 210304013063, 210304013066, 210304013068, 210304013069, 210304013093.	G-1
3	Pharma Organic Chem-II(BP301)	04/06/2021 To 25/06/2021	10:00- AM to 12:00PM	200304013006, 200304013009, 200304013043 200304013056, 200304013057, 200304013068 200304013086.	F-10

Prof Dr Amol Pachpute

Remedial class Coordinator

Dean

SOP, SSSUTMS

Dean

School of Pharmacy

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REMEDIAL CLASSES ATTENDENCE SHEET

2021-22

CLASS: I YEAR (I SEM)

NAME OF COURSE:- PHARMACEUTICAL INORGANIC CHEMISTRY

CORSE CODE:(BP-104)

Sr no.	Enroll. no	Name of Student	Date 7/6/22 Sign	Date 11/6/22 Sign	Date 18/6/22 Sign	Date 25/6/22 Sign
1	210304013002	YUVRAJ SINGH SONGARA	Yubraj	Yubraj	Yubraj	Yubraj
2	210304013003	SHUBHAM SEN	Shubham	Shubham	Shubham	Shubham
3	210304013005	: ANKIT THAKUR	AThakur	AThakur	AThakur	AThakur
4	210304013013	AJAY PANCHAL	Ajay	Ajay	Ajay	Ajay
5	210304013014	SHOYAB	Soyab	Soyab	Soyab	Soyab
6	210304013026	AMAN SAGWALIYA	ASagwaliya	ASagwaliya	ASagwaliya	ASagwaliya
7	210304013029	NAWAB KHAN	Nawab	Nawab	Nawab	Nawab
8	210304013030	ABHISHEK MEWADA	Abhishek	ABSENT	Abhishek	Abhishek
9	210304013056	KISMAT KHAN	Kismat	Kismat	Kismat	Kismat
10	210304013062	YASH RAO	Yash	Yash	Yash	Yash
11	210304013063	SHAHIR MANSOORI	Sahir	Sahir	Sahir	Sahir.
12	210304013066	ANKIT THAKUR	Ankit	Ankit	Ankit	ABSENT
13	210304013068	PRADEEP CHOUHAN	Pradeep	Pradeep	Pradeep	Pradeep
14	210304013069	ARCHANA KUMARI	Archana	Archana	Archana	Archana
15	210304013093	RAI SINGH	Raisingh	Raisingh	Raisingh	Raisingh

BPatel

Mr Brijendra Patel

Remedial class Incharge

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Dean

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NOTICE
REMEDIAL CLASSES ATTENDENCE SHEET
2021-22

CLASS: I YEAR (I SEM)

NAME OF COURSE:- PHARMACEUTICAL ANALYSIS – I

CORSE CODE:(BP-102)

Sr no.	Enroll. no	Name of Student	Date 4/6/22 Sign	Date 11/6/22 Sign	Date 18/6/22 Sign	Date 25/6/22 Sign
1	210304013001	YASHRAJ KUSHWAHA	Yash	Yash	Yash	Yash
2	210304013013	AJAY PANCHAL	Ajay	Ajay	Ajay	Ajay
3	210304013014	SHOYAB	Soyab Khan	Soyab Khan	Soyab Khan	Soyab Khan
4	210304013022	VASIM MANSURI	V Mansuri	V Mansuri	V Mansuri	V Mansuri
5	210304013026	AMAN SAGWALIYA	A Sagwaliya	A Sagwaliya	A Sagwaliya	A Sagwaliya
6	210304013029	NAWAB KHAN	Nawab	Nawab	Nawab	Nawab
7	210304013042	HARSH PATIDAR	Harsh	Harsh	Harsh	Harsh
8	210304013057	ABHISHEK KUMAR	Abhisek	Abhisek	Abhisek	Abhisek
9	210304013061	SHAHRUKH BEG	Shahrukh	Shahrukh	Shahrukh	Shahrukh
10	210304013072	VISHAL MEWADA	Vishal	Vishal	Vishal	Vishal
11	210304013078	MOHIT VERMA	Mohit	Mohit	Mohit	Mohit
12	210304013083	CHAHAT RUTHIA	C Ruthia	C Ruthia	C Ruthia	C Ruthia

Kothwade

Prof Dr Harshad Kothwade
Remedial class Coordinator

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Registrar
Sri Satya Sai University
of Technology & Medical Sciences
Sehore (M.P.)

Dean
SOP, SSSUTMS
Dean
School of Pharmacy
Sri Satya Sai University of Technology
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SRI STYA SAI UNIERSITY OF TEHNOLOGY & MEDICAL SCIENCES
SEHORE
REMEDIAL CLASSES ATTENDENCE SHEET
2021-22

CLASS: II YEAR B.Pharma (III SEM)

NAME OF COURSE:- PHARMACEUTICAL ORGANIC CHEMISTRY

CORSE CODE:(BP-301)

Sr no.	Enroll. no	Name of Student	Date 4/6/2022 Sign	Date 11/6/2022 Sign	Date 18/6/2022 Sign	Date 25/6/2022 Sign
1	200304013006	RAJ MANGAL SINGH	Raj mangal Singh	Rajmangal Singh	Rajmangal Singh	Rajmangal Singh
2	200304013009	RAVENDRA PAL SINGH LODHI	Rajendra	Rajendra	Rajendra	Rajendra
3	200304013043	IQBAL KHAN	Iqbal	Iqbal	Iqbal	Iqbal
4	200304013056	RAJ VERMA	Rajverma	Rajverma	Rajverma	Rajverma
5	200304013057	LOKENDRA RAJPOOT	Lokendra	Lokendra	Lokendra	Lokendra
6	200304013068	KAVITA YADAV	ABSENT	ABSENT	ABSENT	Ab
7	200304013086	CHETAN	Chetan	Chetan	Chetan	Chetan

Jagdish

DR Jagdish Pati
Remedial class Incharge

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School of Pharmacy
Sri Satya Sai University of Technology and Medical Sciences, Sehore (M.P.)

Dean
SOP, SSSUTMS

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Branch : Electronics and Communication Engineering						
Semester III					**(2021-22)**	
Subject Code :		**BEA-301**	**ECA-302**	**ECA-303**	**ECA-304**	**ECA-305**
S.No.	Name of Candidate	Mid Sem Test	Mid Sem Test	Mid Sem Test	Mid Sem Test	Mid Sem Test
		Marks - 30	Marks - 30	Marks - 30	Marks - 30	Marks - 30
1	ARJUN KUMAR MAHTO	26	26	25	28	27
2	NITU KUMAR	25	24	26	26	24
3	PRABHAT KUMAR	26	26	24	26	15
4	KUMAR ADITYA	25	27	25	25	26
5	KUNAL RAM SONAR	25	26	26	26	27
6	PUJA KUMAR	26	27	25	27	26
7	IMRAN SHEKH INKLAB	26	26	24	26	25
8	PRITI KUMARI	25	27	25	27	24

9	SHUBHAM ARUN MANDGE	24	26	26	26	26

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Branch : Electronics and Communication Engineering						
Semester III						(2021-22)
Subject Code :		BEA- 301	ECA- 302	ECA- 303	ECA-304	ECA-305
S.No.	Name of Candidate	PUT Test	PUT Test	PUT Test	PUT Test	PUT Test
		Marks - 60	Marks - 60	Marks - 60	Marks - 60	Marks - 60
1	ARJUN KUMAR MAHTO	51	55	54	48	51
2	NITU KUMAR	52	54	55	46	55
3	PRABHAT KUMAR	55	55	53	48	22
4	KUMAR ADITYA	51	53	52	44	54
5	KUNAL RAM SONAR	52	52	55	55	52
6	PUJA KUMAR	55	55	51	54	54
7	IMRAN SHEKH INKLAB	54	51	52	52	52
8	PRITI KUMARI	55	52	54	54	48
9	SHUBHAM ARUN MANDGE	53	54	53	52	46

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTRONIC DEVICES (ECA- 304)

Assignment

1. What is meant by avalanche breakdown?
2. Give the expression for diffusion current density
3. Determine the total forward bias current density in a PN junction diode under an applied forward bias voltage of 0.65 V at 300K. Assume Js=4.155 x 10 -11 A/Cm2
4. Define Diffusion capacitance (A/M-2019) 5. Write down equation for diode current.
6. State the relationship between diffusion capacitance and diode current in a PN diode
7. State the difference between diffusion current and drift current?
8. Calculate the built in potential barrier in a pn junction diode having following specification: T= 300K, Na = 10 18 cm-3 , Nd = 10 15 cm-3 and ni= 1.5 x 10 10 cm-3.
9. Define Peak Inverse Voltage (PIV).
10. Find the voltage at which the reverse current in a germanium PN junction diode attains a value of 90% of its saturation value at room temperature.

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Remedial classes Time Table

November – 2021

(Electronics and Communication Engineering)

ELECTRONIC DEVICES

Student Name	**Semester**	**Subject**	**Day**	**Time**
ARJUN KUMAR MAHTO	3rd Semester	ECA-304 Electronics Devices	Saturday	**11:00am-12:30pm**
NITU KUMAR	3rd Semester	ECA-304 Electronics Devices	Saturday	**11:00am-12:30pm**
PRABHAT KUMAR	3rd Semester	ECA-304 Electronics Devices	Saturday	**11:00am-12:30pm**
KUMAR ADITYA	3rd Semester	ECA-304 Electronics Devices	Saturday	**11:00am-12:30pm**
KUNAL RAM SONAR	3rd Semester	ECA-304 Electronics Devices	Saturday	**11:00am-12:30pm**

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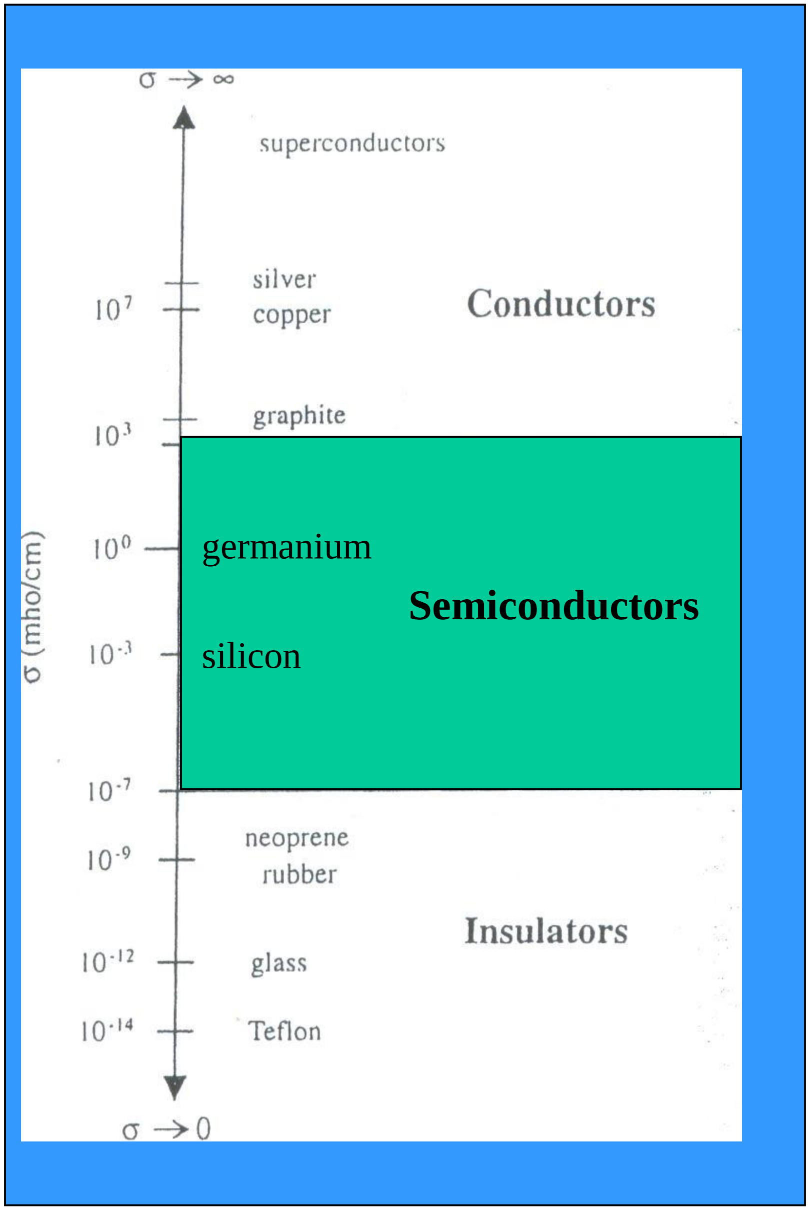
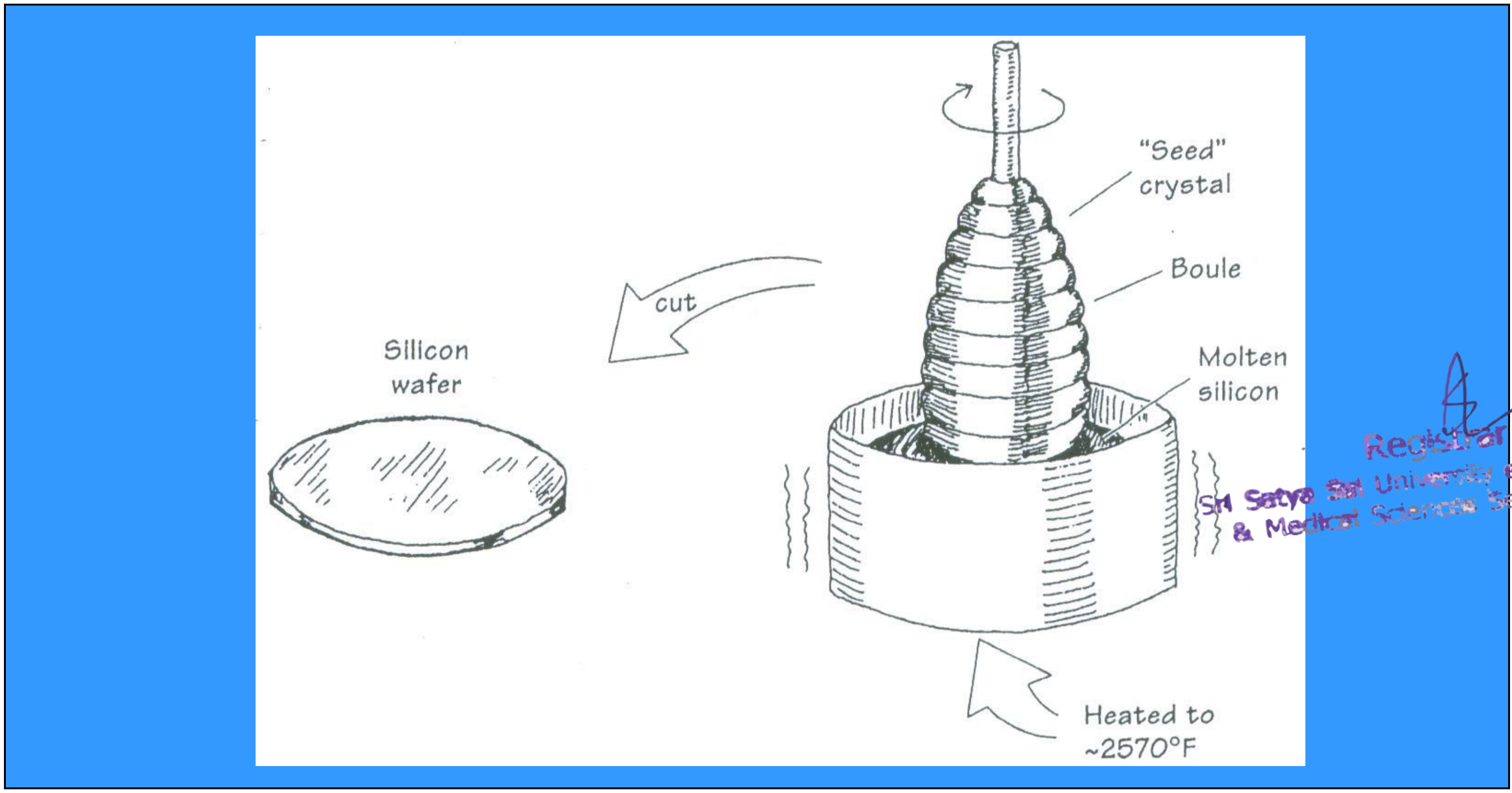
Semiconductor —I

- Materials that permit flow of electrons are called conductors (e.g., gold, silver, copper, etc.).
- Materials that block flow of electrons are called insulators (e.g., rubber, glass, Teflon, mica, etc.).
- Materials whose conductivity falls between those of conductors and insulators are called semiconductors.
- Semiconductors are "part-time" conductors whose conductivity can be controlled.



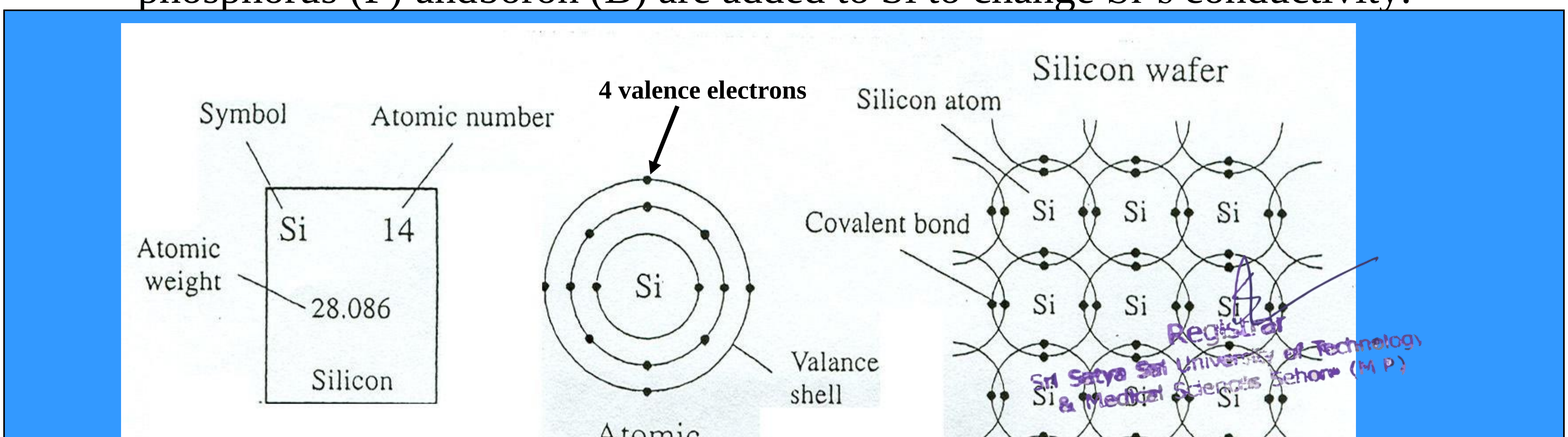
Semiconductor —II

- Silicon is the most common material used to build semiconductor devices.
- Si is the main ingredient of sand and it is estimated that a cubic mile of seawatercontains 15,000 tons of Si.
- Si is spun and grown into a crystalline structure and cut into wafers to makeelectronic devices.



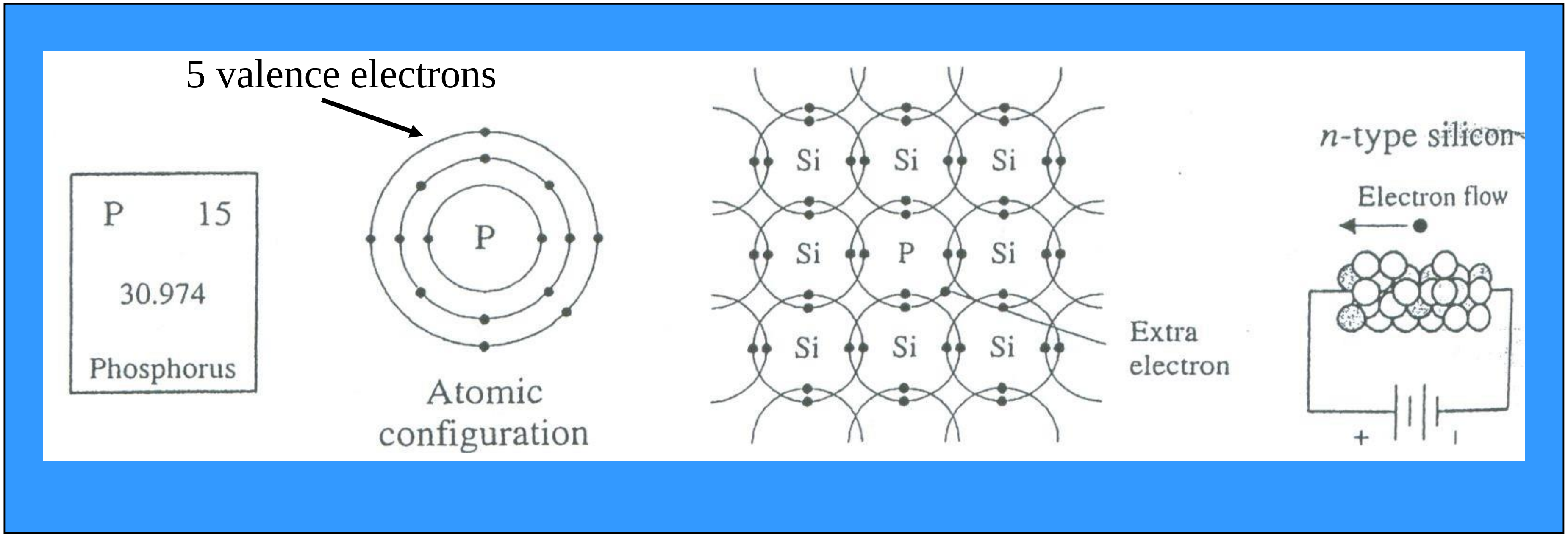
Semiconductor —III

- Atoms in a pure silicon wafer contains four electrons in outer orbit (called valenceelectrons).
  - Germanium is another semiconductor material with four valence electrons.
- In the crystalline lattice structure of Si, the valence electrons of every Si atom arelocked up in covalent bonds with the valence electrons of four neighboring Si atoms.
  - In pure form, Si wafer does not contain any free charge carriers.
  - An applied voltage across pure Si wafer does not yield electron flow through the wafer.
  - A pure Si wafer is said to act as an insulator.
- In order to make useful semiconductor devices, materials such as phosphorus (P) andboron (B) are added to Si to change Si's conductivity.



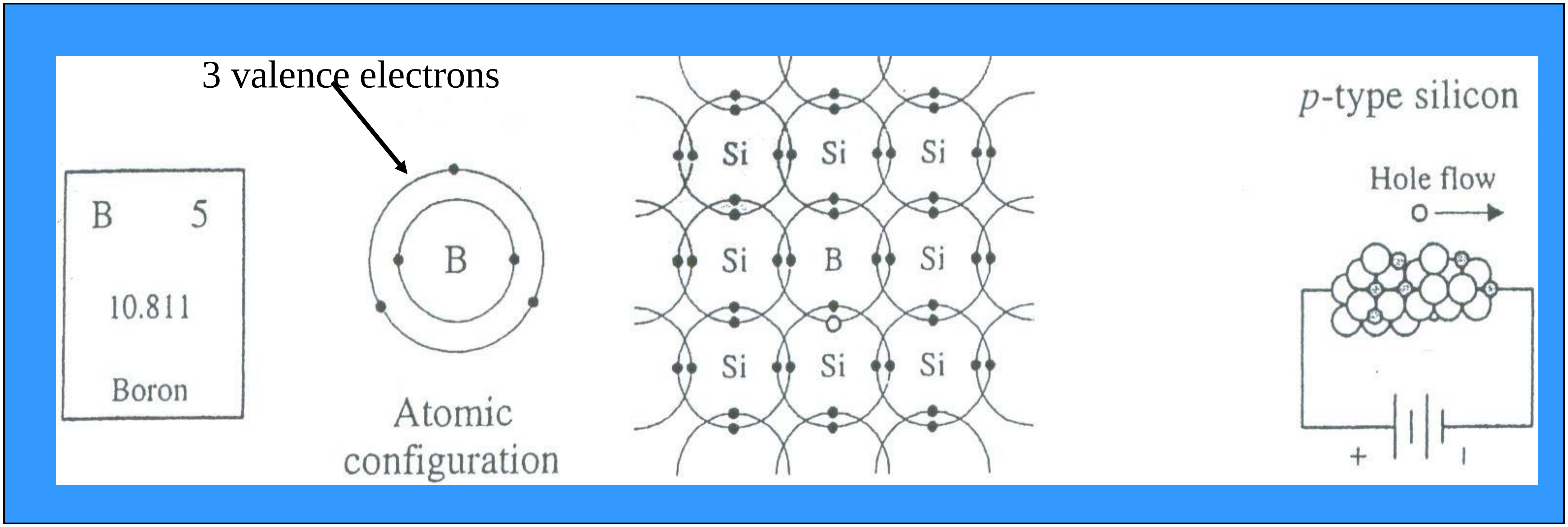
N-Type Silicon

- Pentavalent impurities such as phosphorus, arsenic, antimony, and bismuth have 5 valence electrons.
- When phosphorus impurity is added to Si, every phosphorus atom's four valence electrons are locked up in covalent bond with valence electrons of four neighboring Si atoms. However, the 5th valence electron of phosphorus atom does not find a binding electron and thus remains free to float. When a voltage is applied across the silicon-phosphorus mixture, free electrons migrate toward the positive voltage end.
- When phosphorus is added to Si to yield the above effect, we say that Si is doped with phosphorus. The resulting mixture is called N-type silicon (N: negative charge carrier silicon).
- The pentavalent impurities are referred to as donor impurities.
-


5 valence electrons
P 15
30.974
Phosphorus
P
Atomic configuration
Si Si Si
Si P Si
Si Si Si
Extra electron
n-type silicon
Electron flow
+

P-Type Silicon —I

- Trivalent impurities e.g., boron, aluminum, indium, and gallium have 3 valence electrons.
- When boron is added to Si, every boron atom's three valence electrons are locked upin covalent bond with valence electrons of three neighboring Si atoms. However, a vacant spot "hole" is created within the covalent bond between one boron atom and a neighboring Si atom. The holes are considered to be positive charge carriers. When a voltage is applied across the silicon-boron mixture, a hole moves toward thenegative voltage end while a neighboring electron fills in its place.
- When boron is added to Si to yield the above effect, we say that Si is doped with boron. The resulting mixture is called P-type silicon (P: positive charge carrier silicon).
- The trivalent impurities are referred to as acceptor impurities.


3 valence electrons
B 5
10.811
Boron
B
Atomic configuration
Si Si Si
Si B Si
Si Si Si
p-type silicon
Hole flow
+

P-Type Silicon —II

- The hole of boron atom points towards the negative terminal.
- The electron of neighboring silicon atom points toward positive terminal.
- The electron from neighboring silicon atom falls into the boron atom filling the hole in boron atom and creating a "new" hole in the silicon atom.
- It appears as though a hole moves toward the negative terminal!

Diode

•A diode is a 2 lead semiconductor that acts as a one way gate to electron flow.

– Diode allows current to pass in only one direction.

•A pn-junction diode is formed by joining together n-type and p-type silicon.

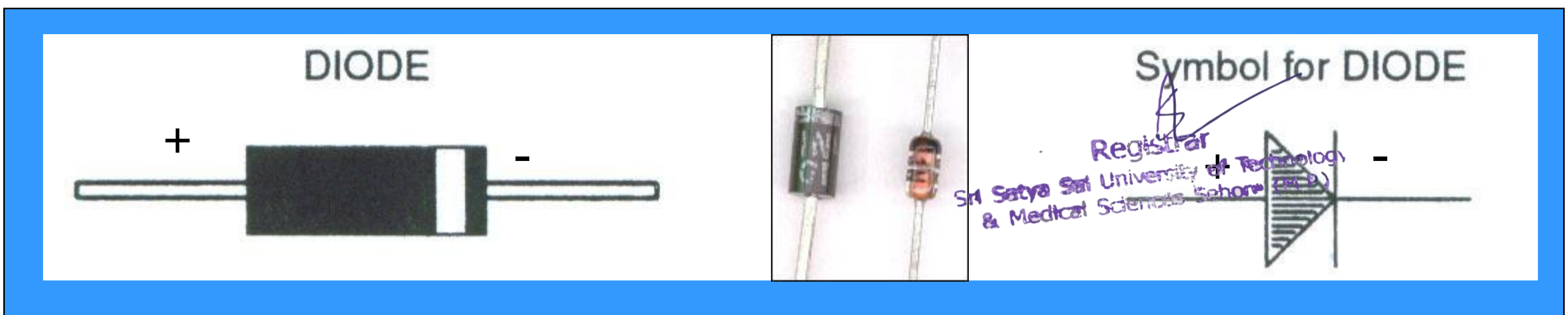
•In practice, as the n-type Si crystal is being grown, the process is abruptly altered to grow p-type Si crystal. Finally, a glass or plastic coating is placed around the joined crystal.

•The p-side is called anode and the n-side is called cathode.

•When the anode and cathode of a pn-junction diode are connected to external voltage such that the potential at anode is higher than the potential at cathode, the diode is saidto be forward biased.

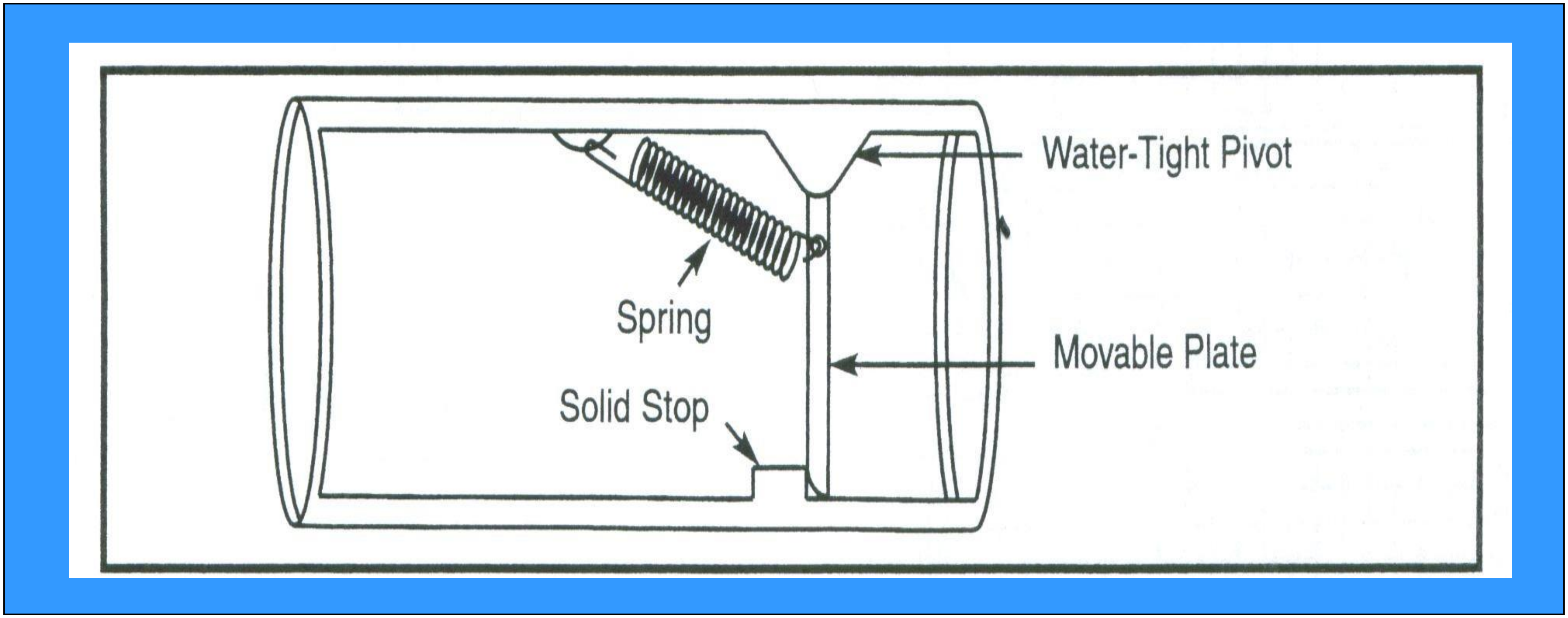
–In a forward-biased diode current is allowed to flow through the device.

•When potential at anode is smaller than the potential at cathode, the



diode is said to be reverse biased. In a reverse-biased diode current is blocked.

Water Analogy of Diodes



- When water pressure on left overcomes the restoring force of spring, the gate isopened and water is allowed to flow $\longrightarrow$.
- When water pressure is from right to left, the gate is pressed against the solid stopand no water is allowed to flow.

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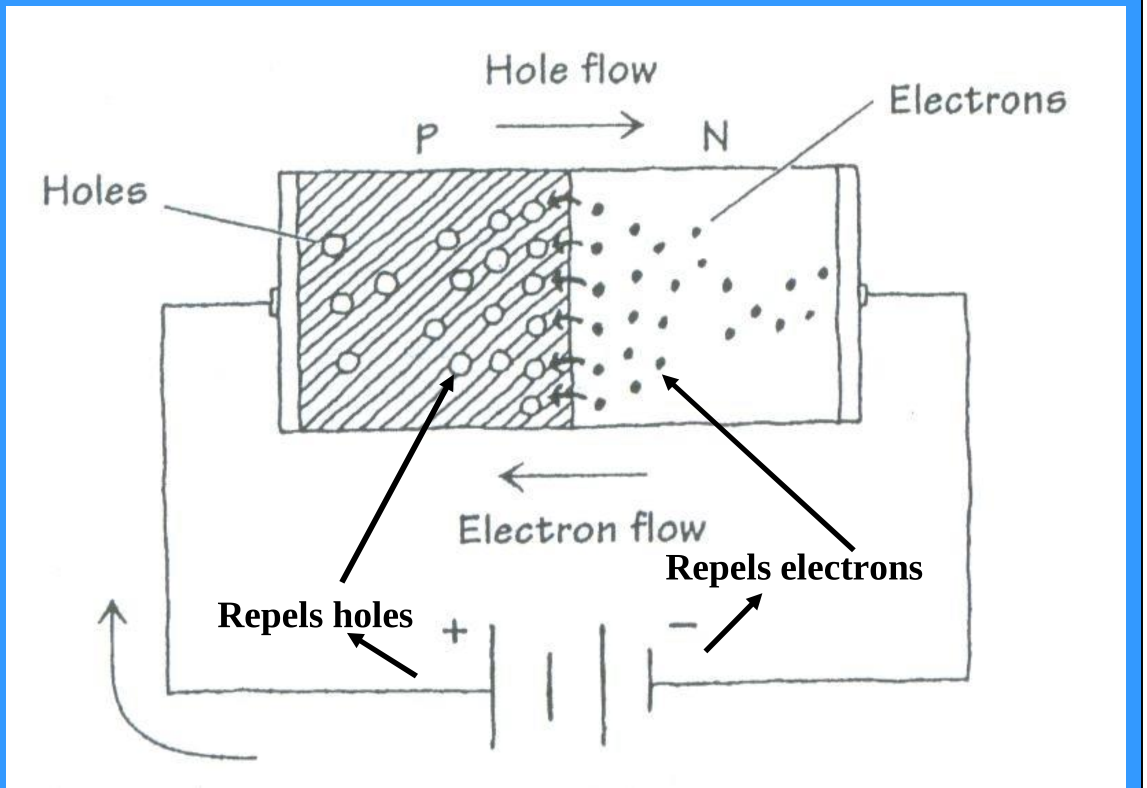
- Spring restoring force is analogous to 0.6V needed to forward bias a Si diode.

Diode: How it Works —I

- When a diode is connected to a battery as shown, electrons from the n-side and holes from the p-side are forced toward the center by the electrical field supplied by the battery. The electrons and holes combine causing the



Forward-biased ("open door")

current to pass through the diode. When a diode is arranged in this way, it is said to be forward-biased.

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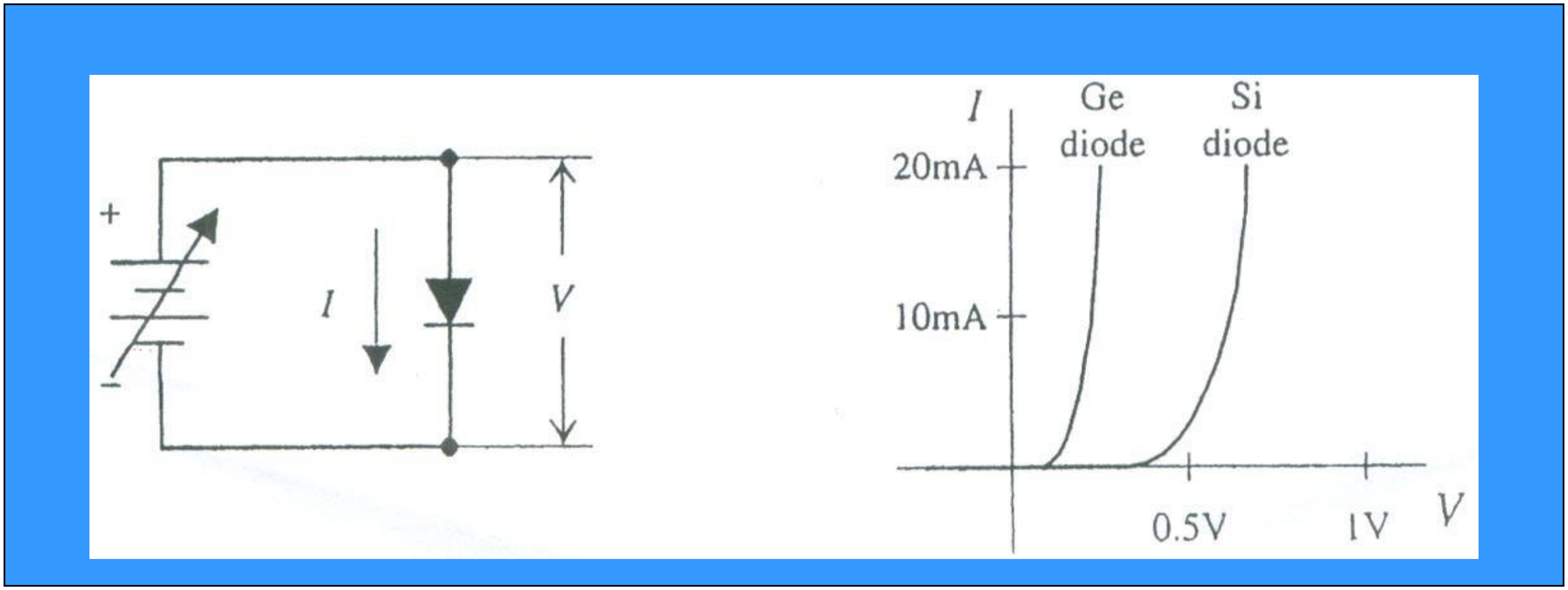
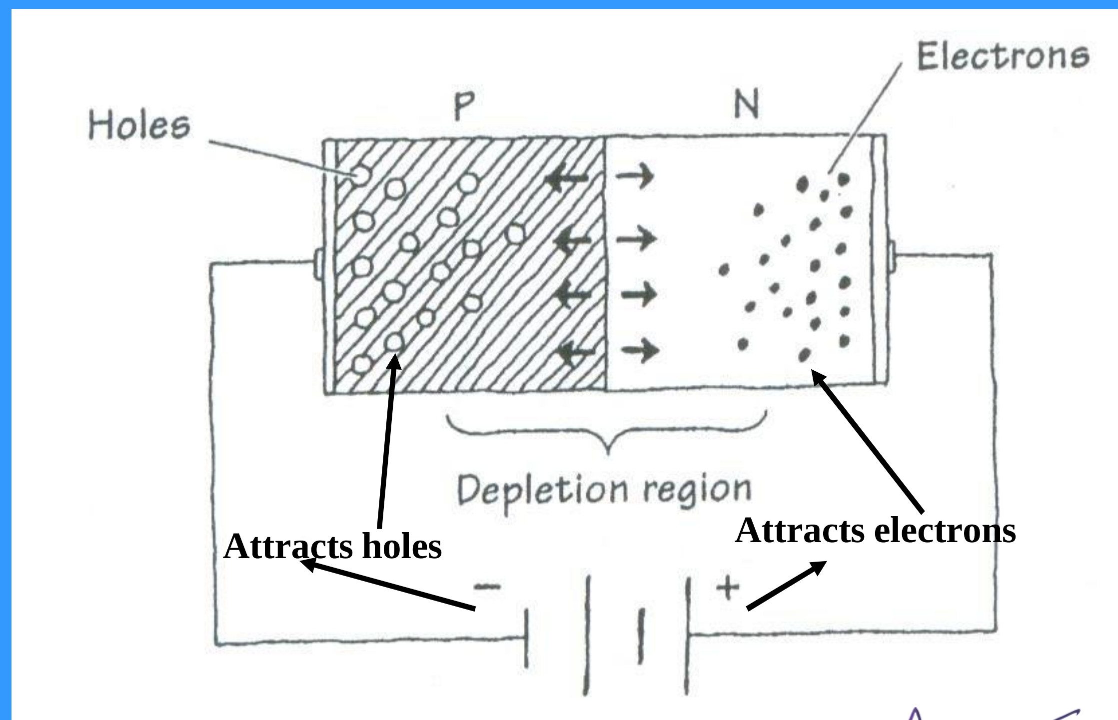
Diode: How it Works—II

- A diode's one-way gate feature does not work all the time.
- Typically for silicon diodes, an applied voltage of 0.6V or greater is needed,otherwise, the diode will not conduct.
- This feature is useful in forming a voltage-sensitive switch.
- I-V characteristics for silicon and germanium diodes is shown below.



Diode: How it doesn't work

- When a diode is connected to a battery as shown, holes in the n- side are forced to the left while electrons in the p-side are forced to the right. This results in an empty zone around the pn-junction that is free of charge carries creating a ***depletion***



Reverse-biased ("closed door")

region. This depletion region acts as an insulator preventing current from flowing through the diode. When a diode is arranged in this way, it is said to be reverse-biased.

Diode Applications —-Half Wave Rectifier

•Diode converts ac input voltage to a pulsed dc output voltage.

•Whenever the ac input becomes negative at diode's anode, the diode blocks currentflow.

$\longrightarrow$ o/p voltage become zero.

•Diode introduces a 0.6V drop so o/p peak is 0.6V smaller than the i/p peak.

•The o/p frequency is same as the i/p frequency.

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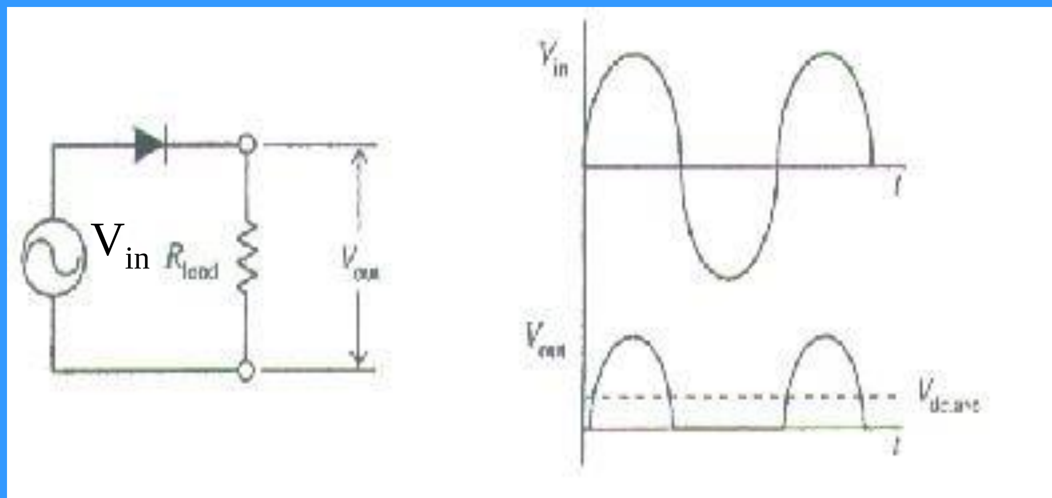
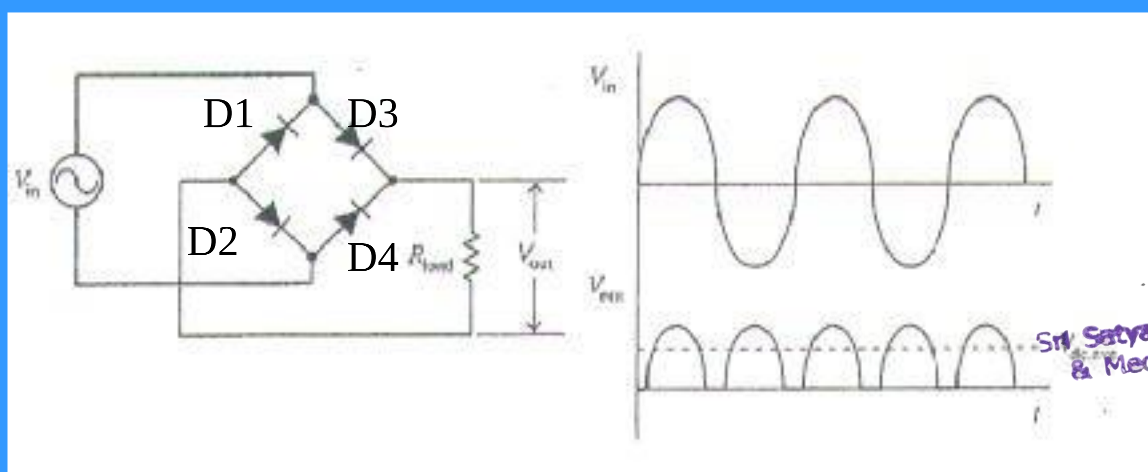
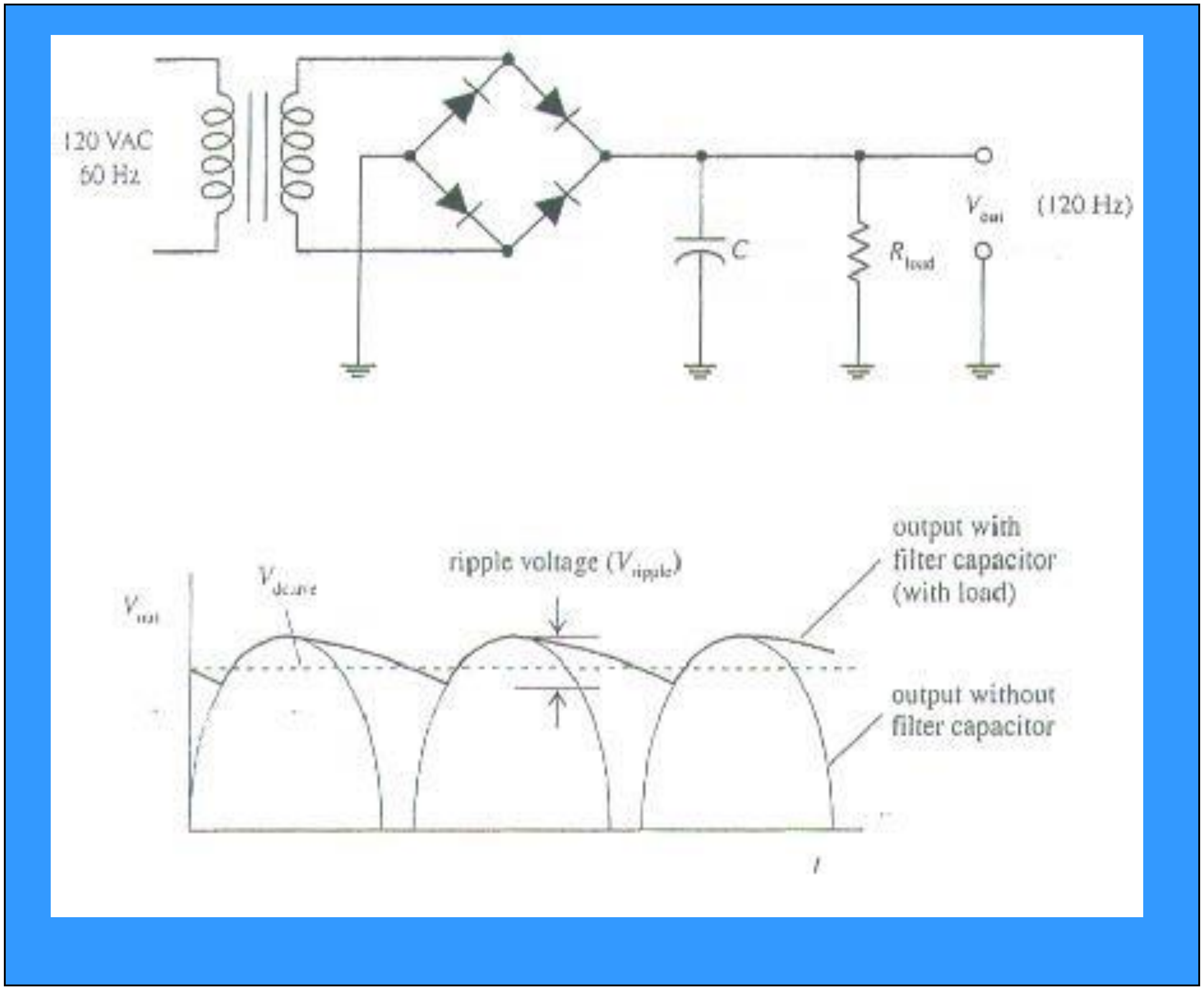

V
in
R_{load}
V_{out}
V_{in}
t
V_{out}
$V_{dc,ave}$
t

Diode Applications —Full Wave Rectifier

- A full-wave rectifier does not block negative swings in the i/p voltage, rather it transforms them into positive swings at the o/p.
- To gain an understanding of device operation, follow current flow through pairs of diodes in the bridge circuit.
- It is easily seen that one pair (D3-R_{out}-D2) allows current flow during the +ve half cycle of V_{in} while the other pair (D4-R_{out}-D1) allows current flow during the -ve halfcycle of V_{in}.
  - $\rightarrow$ o/p voltage peak is 1.2V below the i/p voltage peak.
  - The o/p frequency is twice the i/p frequency.



Diode Applications —AC2DC Power Supply



- An AC2DC power supply is built using a transformer and a full-wave rectifier.
- Transformer is used to step down the voltage i/p.
- Rectifier converts AC to pulsed DC.
- A filter capacitor is used

to smooth out the pulses.

•Capacitor must be large enough to store sufficient charge so as to provide a steady current supply to theload:

$$R_{Load}C >> 1/\ f$$

f is rectified signal’s

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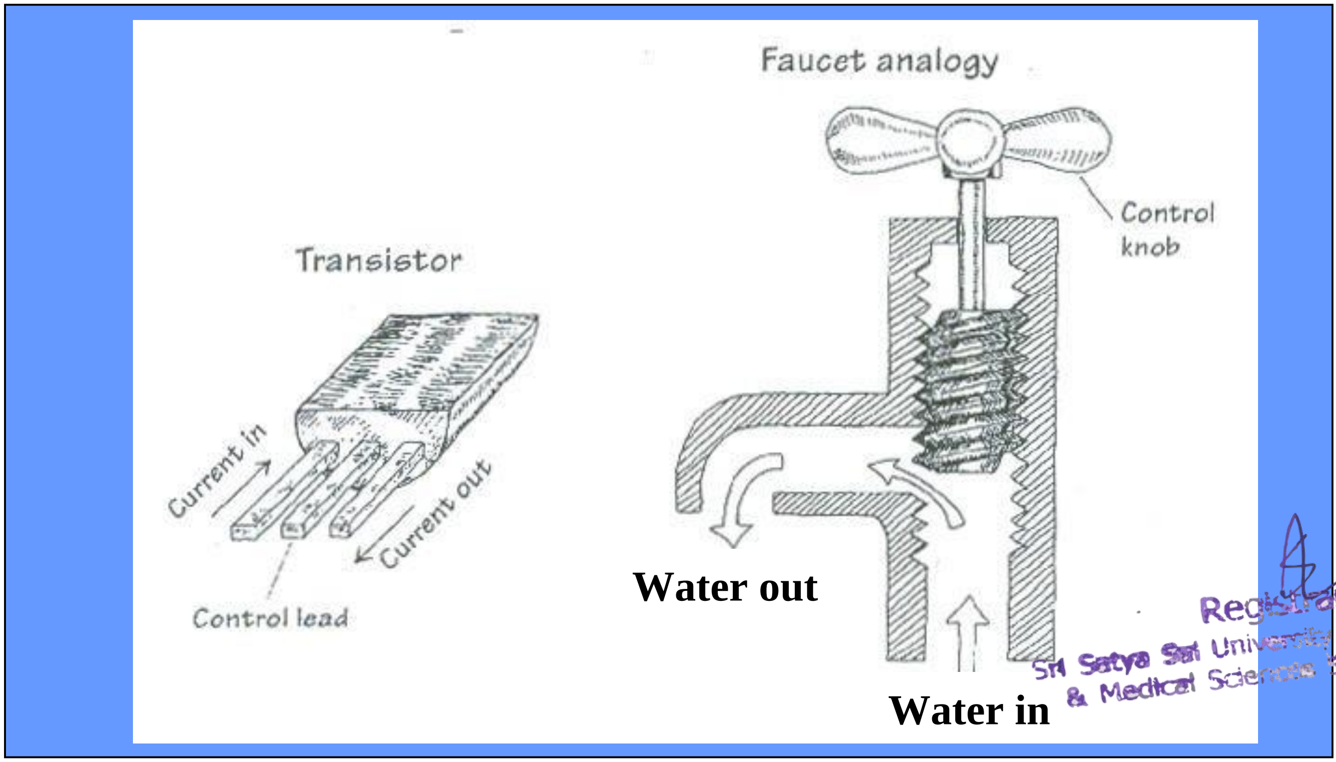
Transistor

- A three lead semiconductor device that acts as:
  - an electrically controlled switch, or
  - a current amplifier.
- Transistor is analogous to a faucet.
  - Turning faucet's control knob alters the flow rate of water coming out from the faucet.
  - A small voltage/current applied at transistor's control lead controls a larger current flowthrough its other two leads.



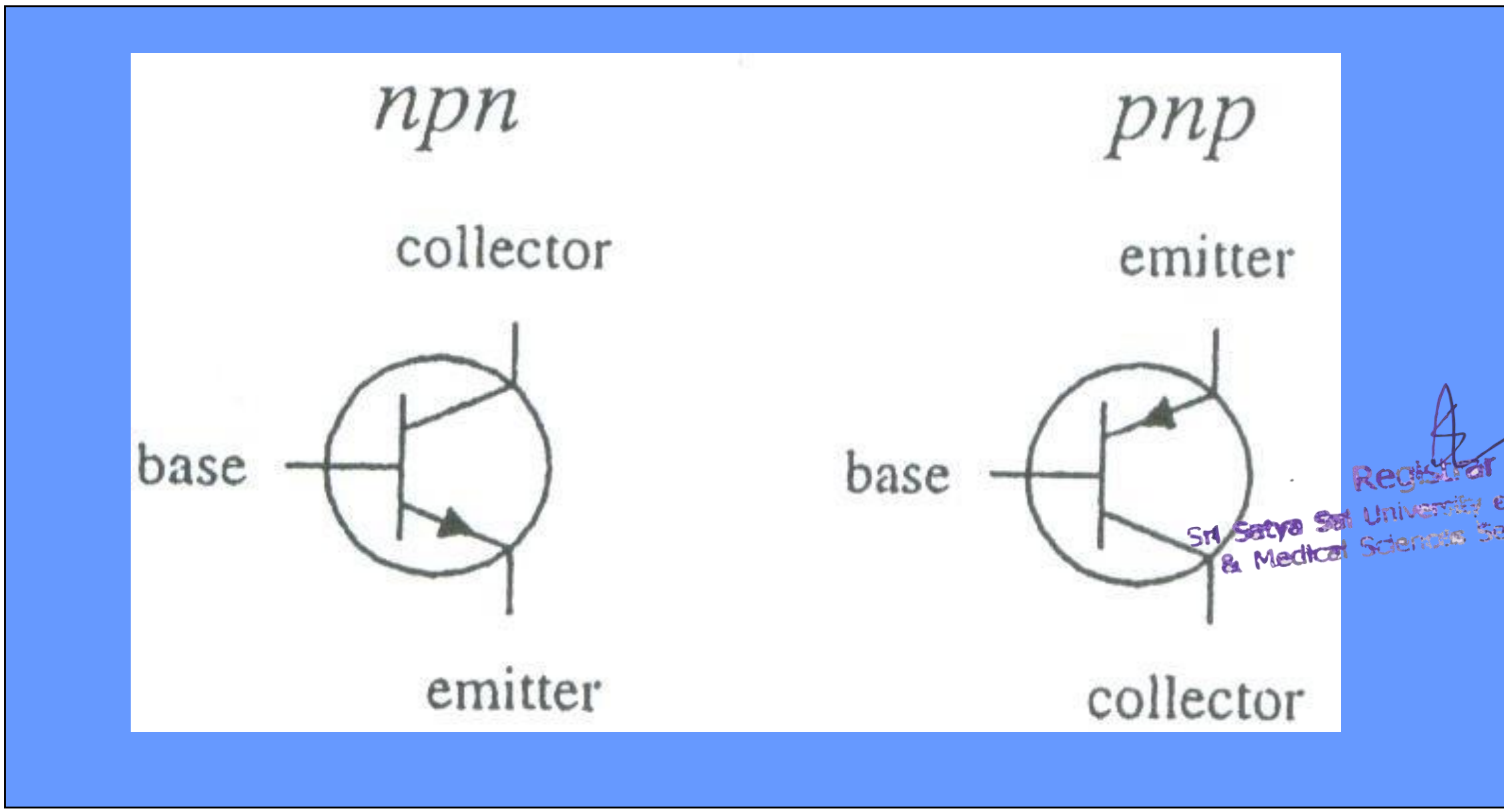
Transistor Types: BJT, JFET, and MOSFET

- **B**ipolar **J**unction **T**ransistor **(BJT)**
  - NPN and PNP
- **J**unction **F**ield **E**ffect **T**ransistor **(JFET)**
  - N-channel and P-channel
- **M**etal **O**xide **S**emiconductor **FET (MOSFET)**
  - Depletion type (n- and p-channel) and enhancement type (n- and p-channel)

BJT	JFET	MO SFE T

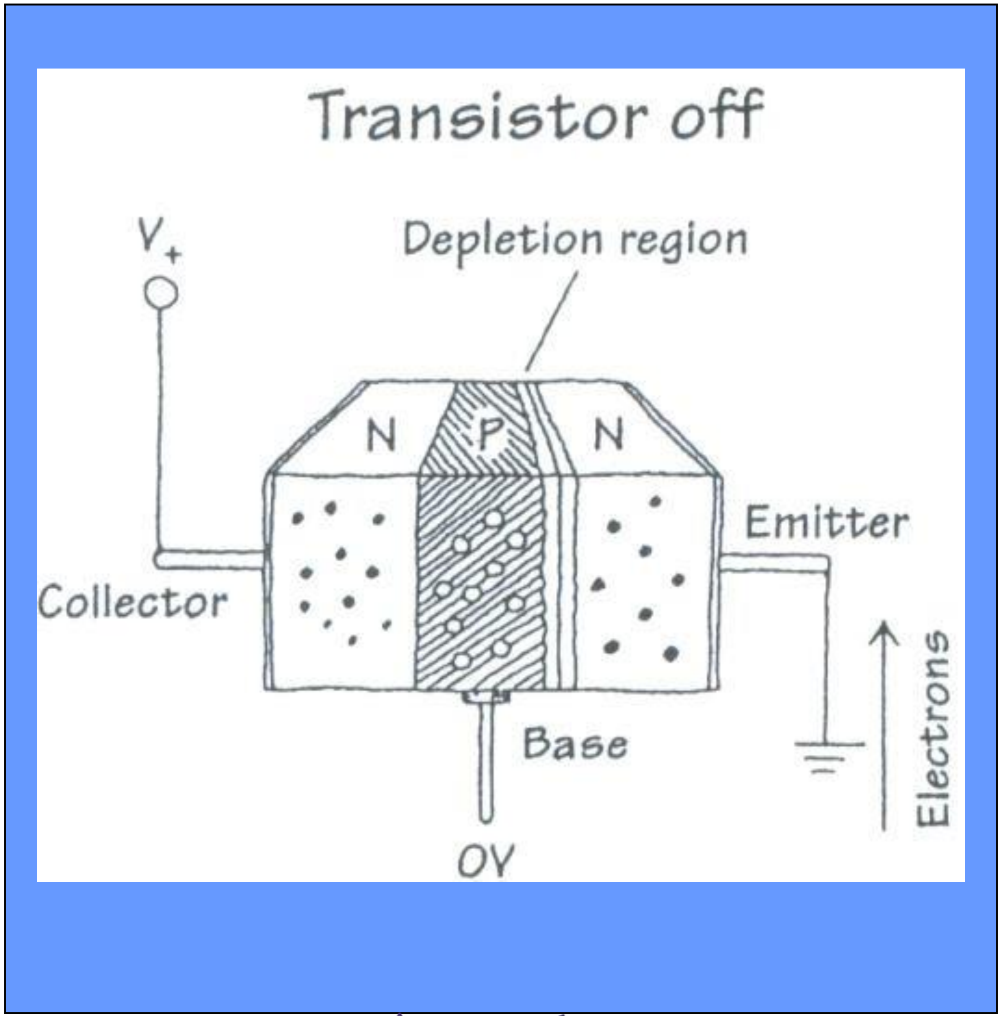
BJT Types

- NPN and
  PNP.
  - NPN: a small input current and a positive voltage applied @ its base (with $V_B > V_E$)allows a large current to flow from collector to emitter.
  - PNP: a small output current and a negative voltage @ its base (with $V_B < V_E$) allows amuch larger current to flow from emitter to collector.



NPN BJT: How it works — I

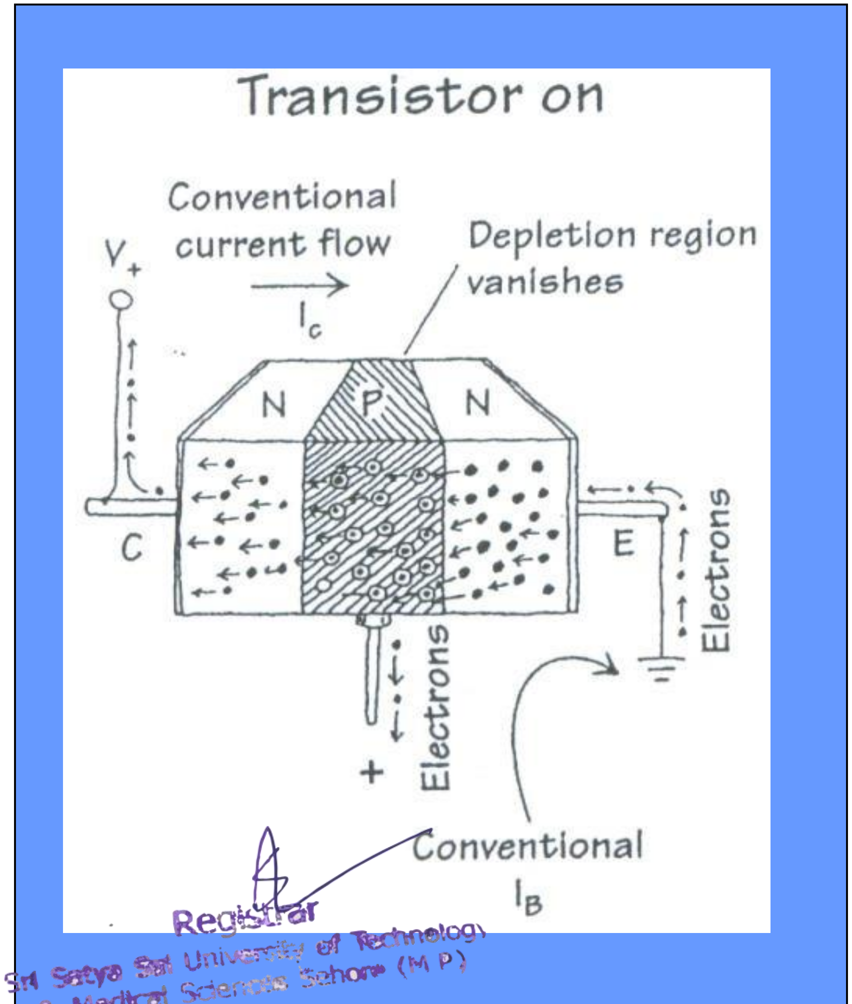
- When no voltage is applied at transistor's base, electrons in the emitter are prevented from passing to the collector side because of the pn junction.
- If a negative voltage is applied to the base, things get even worse as the pn junction between the base and emitter becomes reverse- biased resulting in the formation of a depletion



region that prevents current flow.

NPN BJT: How it works — II

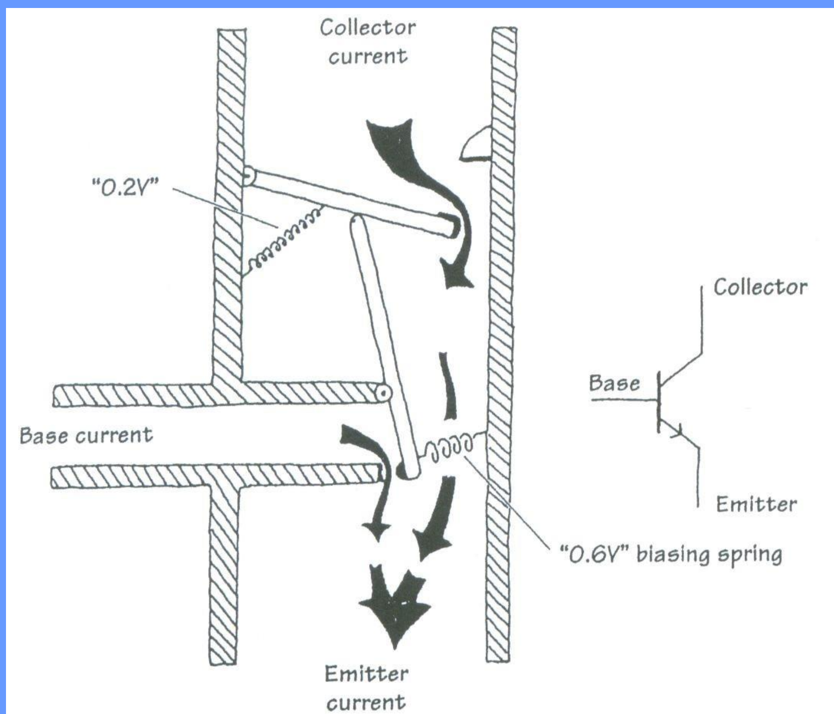
- If a positive voltage (>0.6V) is applied to the base of an npn transistor, the pn junction between the base and emitter becomes forward-biased. During forward bias, escaping electrons are drawn to the positive base.
- Some electrons exit through the base, but because the p-type base is so thin, the onslaught of electrons that leave the emitter get close enough to the collector



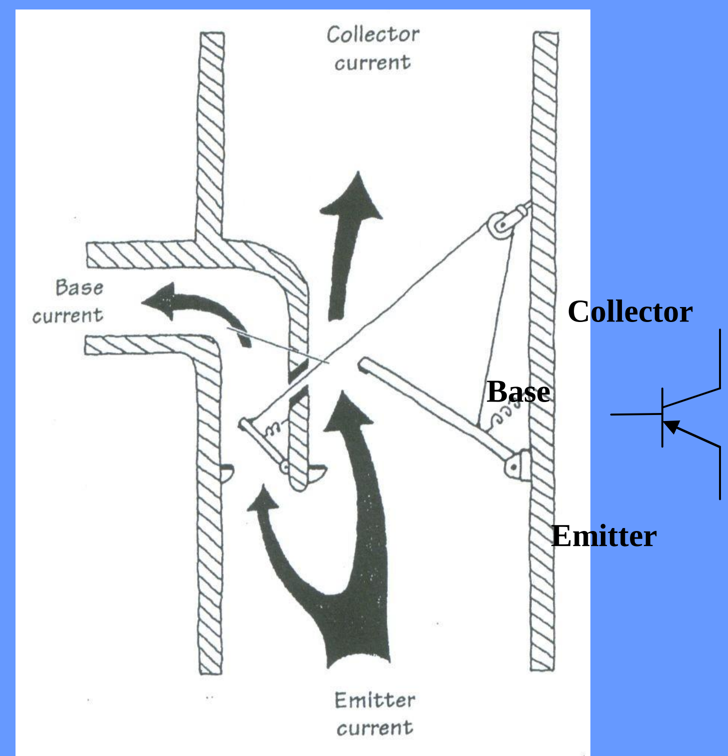
side that they begin jumping into the collector. Increasing the base voltage increases the emitter-to- collector electron flow.

- Recall, positive current flow is in the direction opposite to the electron flow $\rightarrow$current flows fromcollector to emitter.

BJT Water Analogy



NPN ($V_B > V_E$)

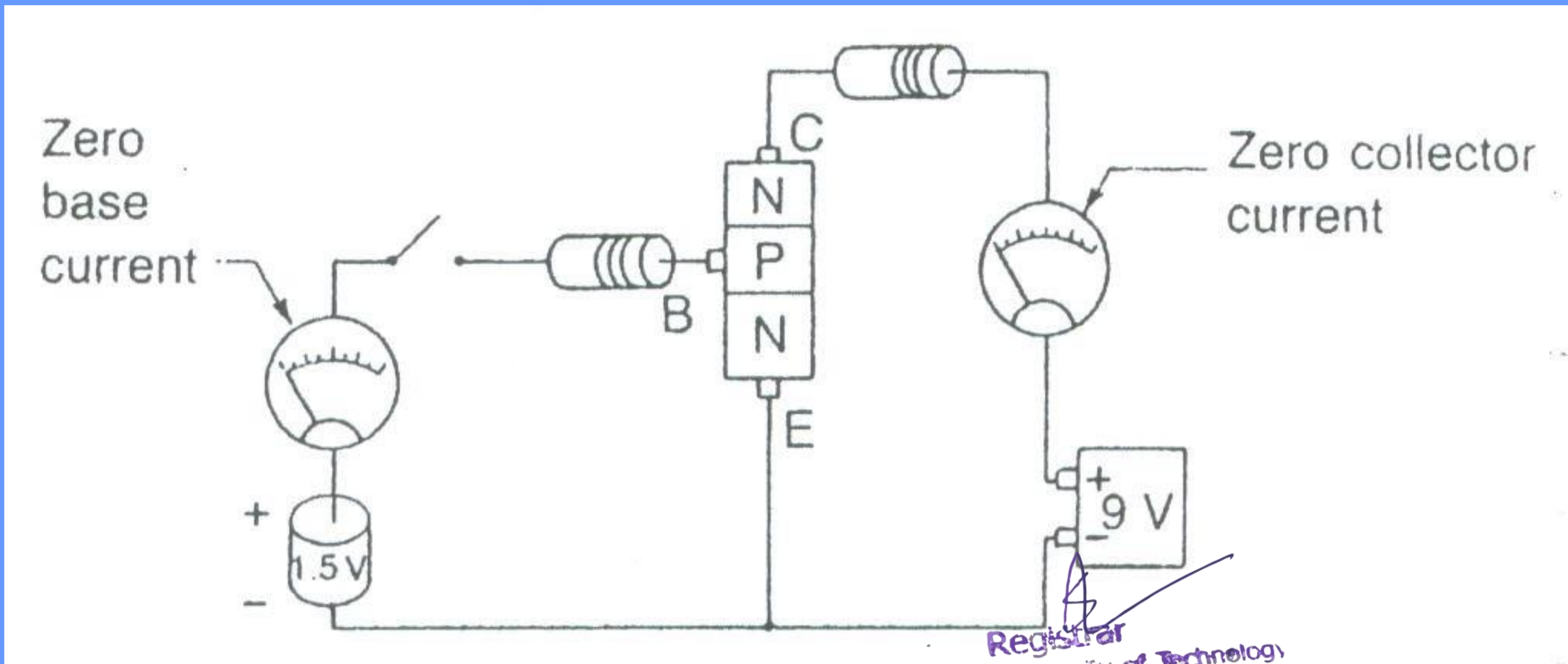


PNP ($V_B < V_E$)

NPN Transistor in a Complete Circuit —I

•Normally OFF.

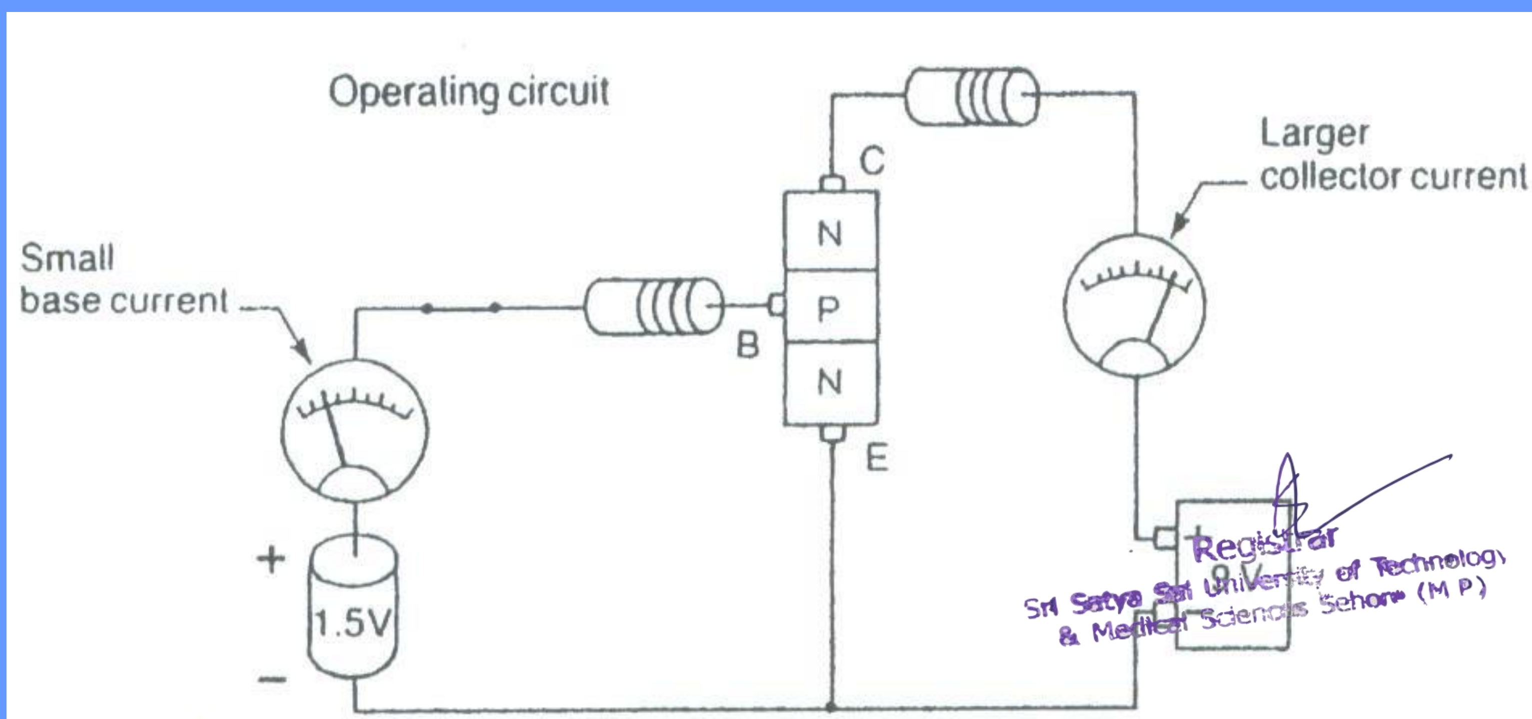
•No current passes from collector to emitter when base is not activated.



NPN: $V_B = V_E \rightarrow$ OFF

NPN Transistor in a Complete Circuit — II

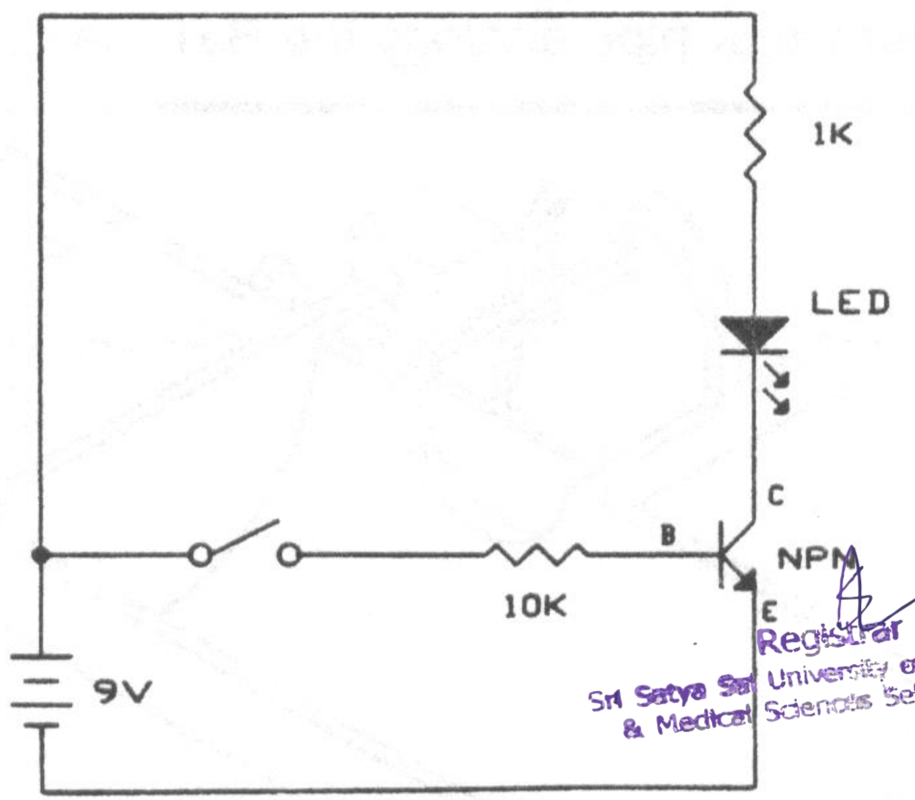
- When $\mathbf{V_B > V_E}$ we have an operating circuit.
- Current passes from collector to emitter when base is activated.



NPN: $V_B > V_E \rightarrow$ON

Transistor Experiment — LED On/Off

- Turning the switch on/off turns the LED on/off.

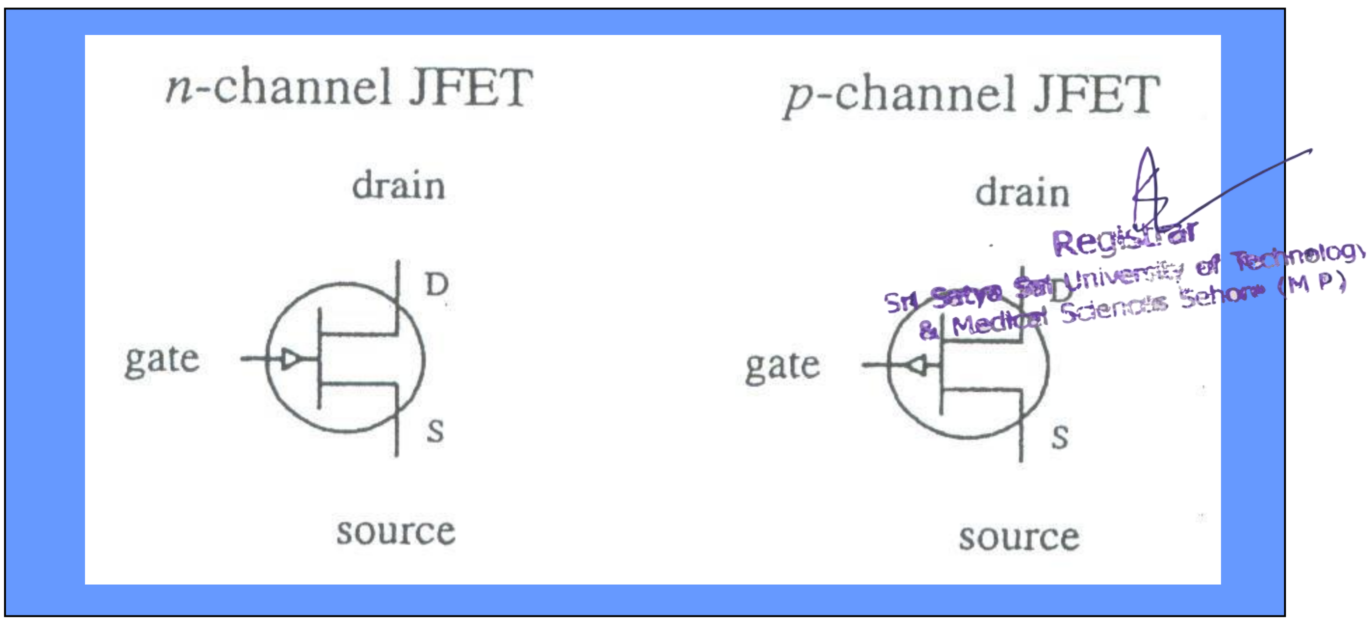


JFET

- Junction field effect transistors like BJTs are three leadsemiconductor devices.
- JFETs are used as:
  - electrically controlled switches,
  - current amplifiers, and
  - voltage-controlled resistors.
- Unlike BJTs, JFETs do not require a bias current and are controlledby using only a voltage.
- JFETs are normally on when $V_G - V_S = 0$.
- When $V_G - V_S \neq 0$, then JFETs become resistive to current flowthrough the drain-source pair $\rightarrow$ "JFETs are depletion devices."

JFET Types

- Two types of JFETs:
  - n-channel and p-channel.
- In n-channel JFET, a –ve voltage applied @ its gate (with $V_G < V_S$) reduces currentflow from drain to source. It operates with $V_D > V_S$.
- In p-channel JFET, a +ve voltage applied @ its gate (with $V_G > V_S$) reduces currentflow from source to drain. It operates with $V_S > V_D$.
- JFETs have very high input impedance and draw little or no input current
  - → if there is any circuit/component connected to the gate of a JFET, no current is drawnaway from or sunk into this circuit.



MOSFET

- Metal oxide semiconductor FET.
- Similar to JFET.
- A metal oxide insulator is placed @ the gate to obtain a high input impedance @ thegate
  - gate input impedance approx. $10^{14}\Omega$.
- Use of insulator as described above yields a low gate-to-channel capacitance.
  - If too much static electricity builds up on the gate, then the MOSFET may be damaged.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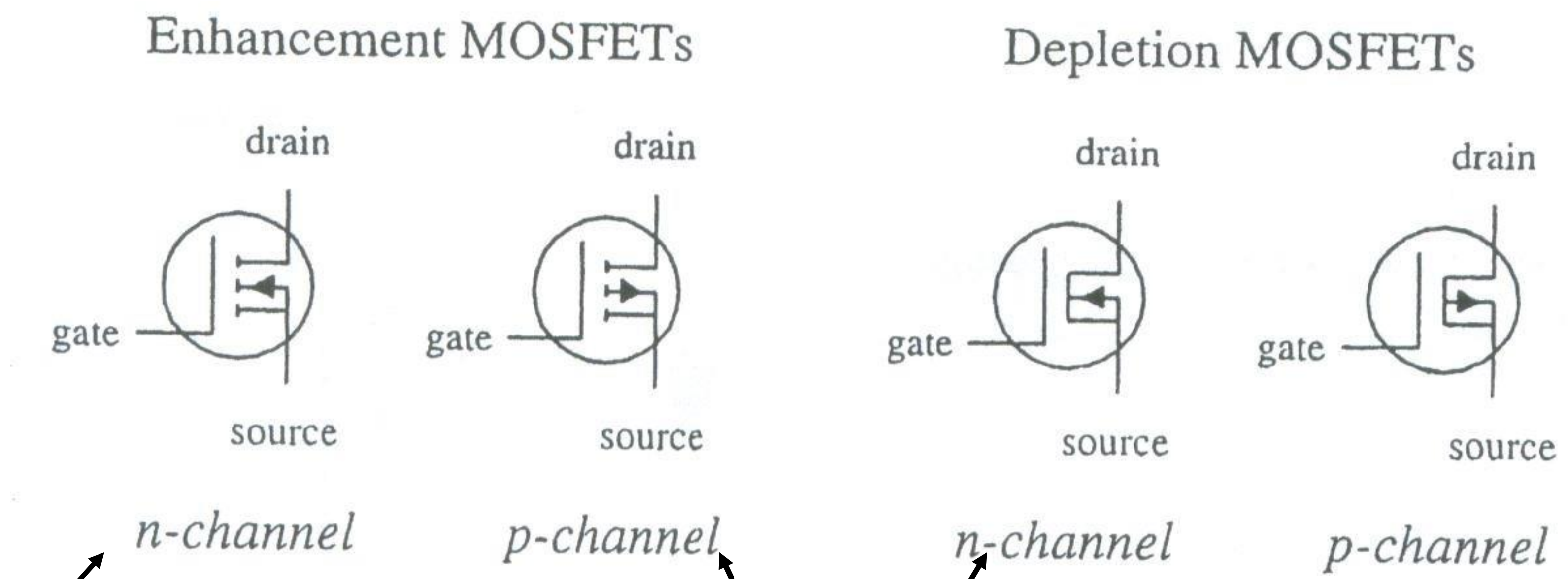
BUZ72L

MOSFET Types

- Enhancement type:
  - Normally off, thus no current flows through drain-source channel when $V_G = V_S$.
  - When a voltage applied @ the gate causes $V_G \neq V_S$ the drain-source channel reducesresistance to current flow.
- Depletion type:
  - Normally on, thus maximum current flows through drain-source channel when $V_G = V_S$.
  - When a voltage applied @ the gate causes $V_G \neq V_S$ the drain-source channel increasesresistance to current flow.



Current flow increases with:

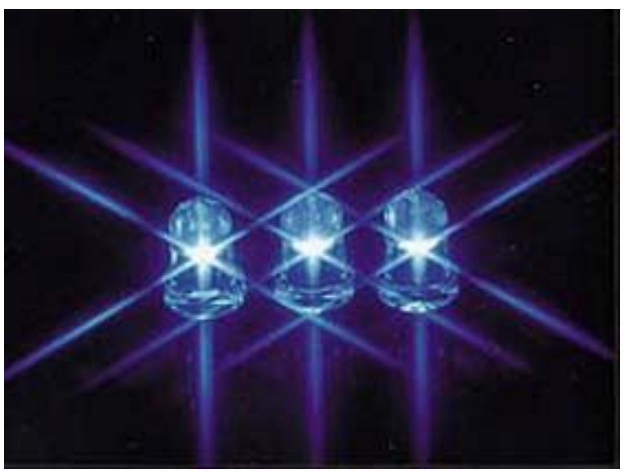
$V_G > V_S$ $V_G < V_S$

Current flow decreases with:

$V_G < V_S$ $V_G > V_S$

Optoelectronics

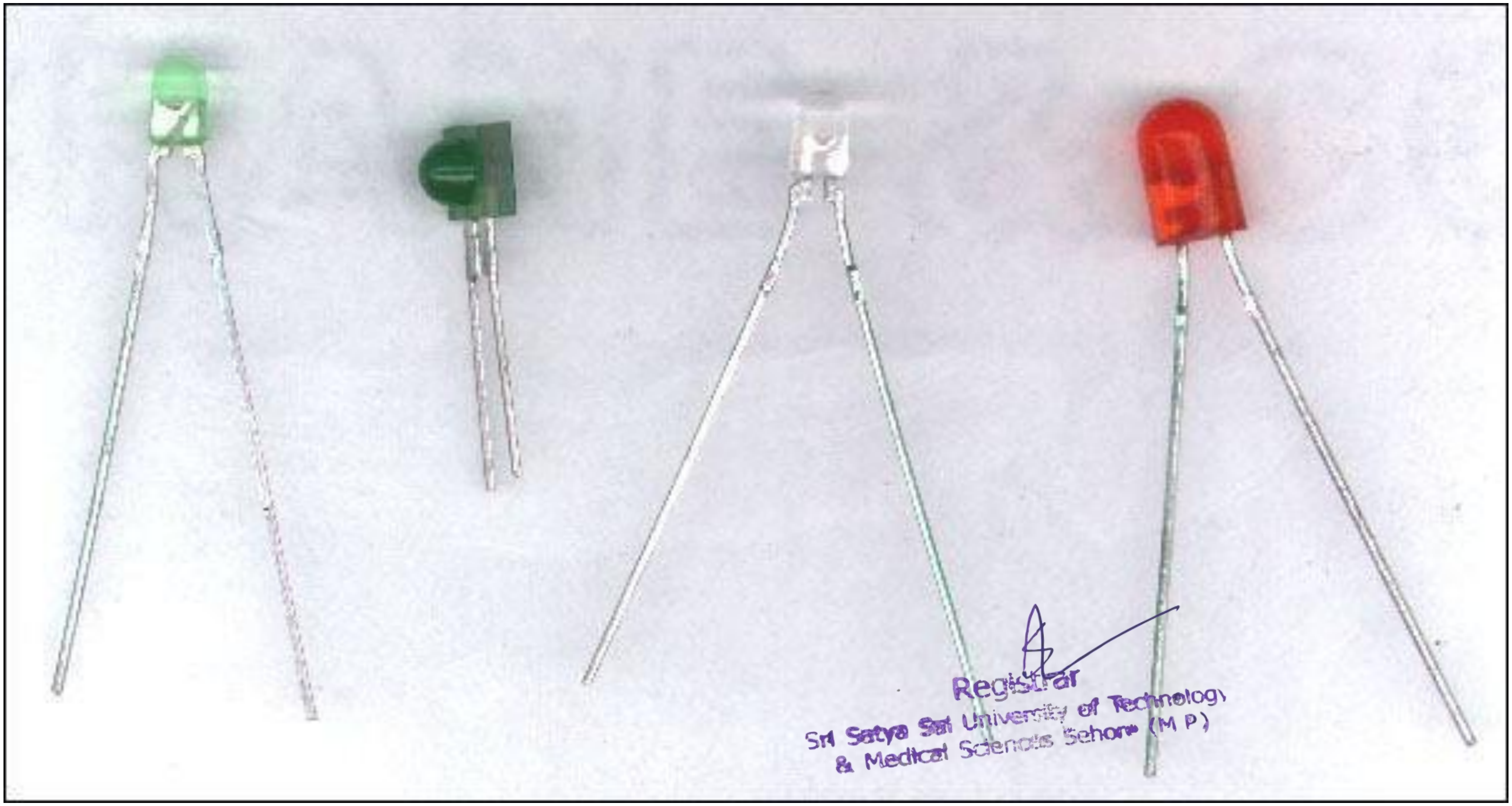
- In optoelectronics we deal with 2 types of electronic devices.
- Light emitting electronic devices: ones that generate electromagnetic energy under the action of electrical field. Example: light emitting diodes (visible and infrared light).
- Light detecting devices: ones that transform electromagnetic energy input into electrical current/voltage. Examples: photoresistors, photodiodes, phototransistors, etc.



Light emitting diodes

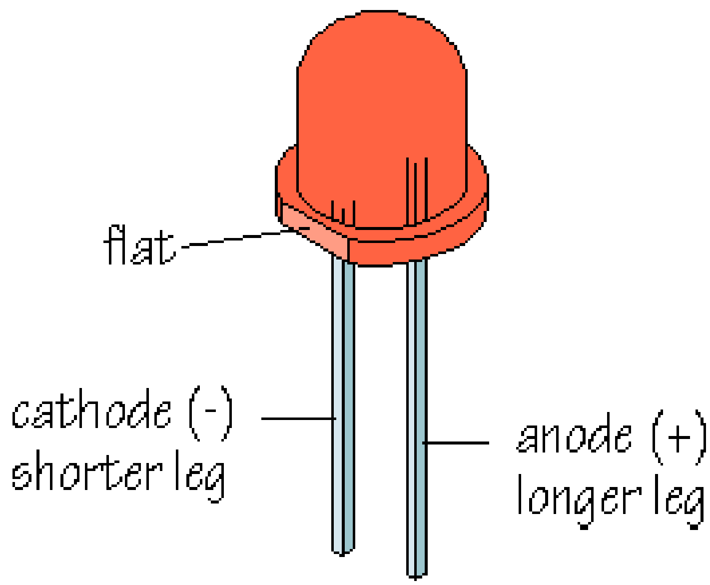
Infrared detector

Light-Emitting Diodes (LEDs)



LED 101— I

- 2 lead semiconductor device.
- Light emitting PN-junction diode.
  - Visible or infrared light.
- Has polarity.
- Recall diodes act as a one way gate to current flow.
  - A forward-biased PN-junction diode allows current flow from anode to cathode.
- An LED conducts and emits light when its anode is made more positive (approx.1.4V) than its cathode.
  - With reverse polarity, LED stops conducting and emitting light.



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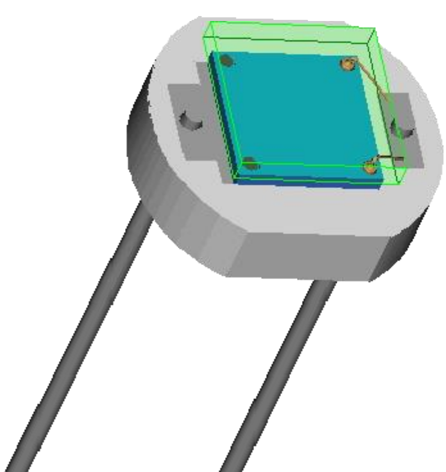
LED 101— II

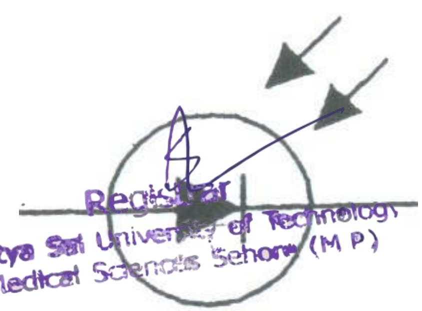
- Similar to diodes, LEDs are current-dependent devices.
  - LED brightness is controlled by controlling current through LED.
    - Too little current through LED $\rightarrow$ LED remains OFF.
    - Small current through LED $\rightarrow$ dimly lit LED.
    - Large current through LED $\rightarrow$ brightly lit LED.
    - Too much current through LED $\rightarrow$ LED is destroyed.
- A resistor placed in series with LED accomplishes current control

Light activated relay Dark activated relay

Photodiode

- Photodiode is a 2 lead semiconductor device that transforms light energy to electriccurrent.
- Suppose anode and cathode of a photodiode are wired to a current meter.
  - When photodiode is placed in dark, the current meter displays zero current flow.
  - When the photodiode is expose to light, it acts a a current source, causing current flowfrom cathode to anode of photodiode through the current meter.
- Photodiodes have very linear light v/s current characteristics.
  - Commonly used as light meters in cameras.
- Photodiodes often have built-in lenses and optical filters.
- Response time of a photodiode slows with increasing surface area.
- Photodiodes are more sensitive than photoresistor.





SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES

[Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh]
Approved by Madhya Pradesh Private University Regulatory Commission
SH-18, Bhopal-Indore Road, Opposite Oilfed Plant, Pachama, Sehore (M.P.) Pin Code – 466001

SCHOOL OF ENGINEERING/ CIVIL ENGINEERING DEPARTMENT

MID-TERM EXAM RESULT (SEPTEMBER-2021)

S.NO.	ROLL NO.	NAME OF STUDENT	SUBJECT CODE			
			CEA-701	CEA-702	CEA-703	CEA-704
1	1801106001	JAYANT BARWA	24	20	27	25
2	1801106002	TARUN BHARTI	28	23	21	27
3	1801106004	RAJAT CHOUDHARY	21	17	26	24
4	1801106007	ABHISHEK MANDLOI	15	13	18	16
5	1801106009	ANKIT	18	21	14	23
6	1801106010	SACHIN SEN	16	22	23	18
7	1801106012	OJASHVI RATHORE	28	25	22	28
8	1801106013	BISHWJEET KUMAR CHANDAN	27	29	28	28
9	1801106014	AYUSHI RATHORE	25	22	27	29
10	1801106018	ANKIT MEWADA	18	17	19	22
11	1801106019	LIKHIL CHOUDHARY	21	16	19	22
12	1801106022	RAVI RANJAN KUMAR	14	16	12	11
13	1801106023	DEEPAK ANIL PARMANI	13	9	20	17
14	1801106024	AIZAZ	22	18	15	21
15	1801106026	SUMAN KUMAR PASWAN	15	13	18	11
16	1801106028	RISHABH KORI	26	23	27	25
17	1801106029	ROHIT SINGH THAKUR	24	22	19	26
18	1801106030	ARHAM ALAM	15	19	22	18
19	1801106031	JAY TAMRAKAR	20	24	21	27
20	1801106033	RAVI KUMAR	23	27	25	24
21	1801106034	ASHISH KUMAR DWIVEDI	19	22	20	18
22	1801106035	ABHILASH PANDEY	16	18	11	17
23	1801106036	HARSHAL KUMAR SINGH	14	19	23	14
24	1801106040	ANAMUL HAKUE	18	21	19	16
25	1801106045	KHAIRNAR VAISHNAV KESHAV	22	19	15	19

HOD

CIVIL ENGINEERING DEPARTMENT

SCHOOL OF ENGINEERING/ CIVIL ENGINEERING DEPARTMENT

PUT EXAM RESULT (NOVEMBER-2021)

S.NO.	ROLL NO.	NAME OF STUDENT	SUBJECT CODE			
			CEA-701	CEA-702	CEA-703	CEA-704
1	1801106001	JAYANT BARWA	42	38	33	49
2	1801106002	TARUN BHARTI	47	40	51	45
3	1801106004	RAJAT CHOUDHARY	32	30	39	35
4	1801106007	ABHISHEK MANDLOI	28	31	26	24
5	1801106009	ANKIT	29	34	25	28
6	1801106010	SACHIN SEN	32	29	25	38
7	1801106012	OJASHVI RATHORE	48	41	53	50
8	1801106013	BISHWJEET KUMAR CHANDAN	45	49	51	55
9	1801106014	AYUSHI RATHORE	38	42	35	48
10	1801106018	ANKIT MEWADA	29	31	37	33
11	1801106019	LIKHIL CHOUDHARY	32	29	38	33
12	1801106022	RAVI RANJAN KUMAR	29	25	27	31
13	1801106023	DEEPAK ANIL PARMANI	32	28	26	30
14	1801106024	AIZAZ	35	39	33	41
15	1801106026	SUMAN KUMAR PASWAN	32	28	29	38
16	1801106028	RISHABH KORI	47	41	53	50
17	1801106029	ROHIT SINGH THAKUR	35	39	42	32
18	1801106030	ARHAM ALAM	30	25	29	26
19	1801106031	JAY TAMRAKAR	39	32	45	37
20	1801106033	RAVI KUMAR	46	42	48	51
21	1801106034	ASHISH KUMAR DWIVEDI	26	32	29	30
22	1801106035	ABHILASH PANDEY	30	26	29	33
23	1801106036	HARSHAL KUMAR SINGH	28	21	23	29
24	1801106040	ANAMUL HAKUE	31	26	29	30
25	1801106045	KHAIRNAR VAISHNAV KESHAV	24	29	33	29

HOD

CIVIL ENGINEERING DEPARTMENT

ADVANCED LEARNER

S.NO.	ROLL NO.	STUDENT'S NAME
1	1801106001	JAYANT BARWA
2	1801106002	TARUN BHARTI
3	1801106004	RAJAT CHOUDHARY
4	1801106012	OJASHVI RATHORE
5	1801106013	BISHWJEET KUMAR CHANDAN
6	1801106014	AYUSHI RATHORE
7	1801106028	RISHABH KORI
8	1801106029	ROHIT SINGH THAKUR

SLOW LEARNER

S.NO.	ROLL NO.	STUDENT'S NAME
1	1801106010	SACHIN SEN
2	1801106022	RAVI RANJAN KUMAR
3	1801106023	DEEPAK ANIL PARMANI
4	1801106034	ASHISH KUMAR DWIVEDI
5	1801106036	HARSHAL KUMAR SINGH
6	1801106035	ABHILASH PANDEY
7	1801106036	HARSHAL KUMAR SINGH
8	1801106040	ANAMUL HAKUE
9	1801106045	KHAIRNAR VAISHNAV KESHAV

Assignments For advanced learner

Quantity Surveying & Costing (CEA-701)

1. Estimate the quantities of brickwork and plastering required in a wall 4m long, 3m high and 30 cm thick. Calculate also the cost if the rate of brickwork is Rs.32.00 per cu.m and of plastering is Rs. 8.50 per sq.m
2. Prepare analysis of rate for $1{:}1^1/_2{:}3$ reinforced cement concrete work in beams , slab etc.
3. What is DPR? Discuss the content of DPR in detail. Differentiate between scrap value & salvage value
4. A newly constructed building stand on plot costing Rs. 130,000/-. The construction cost of the building is Rs.270, 000/- and estimated life is 70years. The investor decides to have 8% returns on his outlay. Annual repairs may be taken as 25% and the interest for sinking fund nay be taken as 4% calculate the monthly rent that will have to be charged for the building.
5. Workout the unit area rate for brickwork in cement mortar 1:6 using country burnt bricks for foundation and basement (For 1m^3; brick 500nos; 0.24m^3 sand; 58kg cement ; Labour :0.7brick masonry ;0.35man, 0.7 women ; rate : bricks Rs. 830/-per Nos ; sand Rs.70/-per 1.0m^3 Cement Rs. 4000/- per tonne ; mason Rs.550/-; man Rs.475/-; women Rs 400/-
6. Write report to accompany an estimate for a residential for a executive engineer.
7. Using the Current Schedule of rates of materials and labours prepare the data for following item of work: i) Plain Cement Concrete 1:5:10 for 1 m^3 ii)Brickwork in foundation with 20×10×10cm bricks with CM 1:6 for 10 m^3.
8. Prepare the rough estimate for a proposed commercial complex for a
   municipal corporation for the following data.
   Plinth Area = 500m2/floor Ht of each storey = 3.5m No. of storey's = G+2
   Cubical content rate = Rs. 1000/m3
   Provided for a following as a percentage of structured cost
   water supply & Sanitary arrangement -8%
   Electrification -6%
   Fluctuation of rates - 5%
   Contractors profit - 10%
   Petty supervision & contingencies - 3%
9. Find the plinth area required for the residential accommodation for an assistant Engineer in the pay scale of Rs.400.00 to 1,000 per month.
10. An old building has been purchased by a person at a cost of Rs.30,000/- excluding the cost of the land. Calculate the amount of annual sinking fund at 4% interest assuming the future life of the building as 20 years and scarp value of the building as 10% of the cost of purchase.

11. The estimated value of a building is Rs.5,00,000.The carpet area of the building is 70 sq.m If the plinth area is 20% more than this ,what is the plinth rate of the building?

TUTORIAL

RULES FOR MEASUREMENT

The rules for measurement of each item are invariably described in IS- 1200. However some of the general rules are listed below.

Measurement shall be made for finished item of work and description of each item shall include materials, transport, labor, fabrication tools and plant and all types of overheads for finishing the work in required shape, size and specification.

In booking, the order shall be in sequence of length, breadth and height or depth or thickness

All works shall be measured subject tothe following tolerances.

linear measurement shall be measured to the nearest 0.01m.

Areas shall be measured to the nearest 0.01sq.m

Cubic contents shall be worked-out to the nearest 0.01 cum and Wood for door and window frames to the accuracy of 0.0001 mt.

Killogram to the accuracy of 0.01

Same type of work under different conditions and nature shall be measured separately under separate items.

The bill of quantities shall fully describe the materials, proportions,workmanships and accurately represent the work to be executed.

In case of masonry (stone or brick) or structural concrete, the categories shall be measured separately and the heights shall bedescribed:

From foundation to plinth level

From plinth level to first floor level

From Fist floor to second floor level and soon.

REQUIREMENTS OF ESTIMATION AND COSTING

Estimate gives an idea of the cost of the work and hence its feasibility can be determined i.e. whether the project could be taken up with in the funds available or not.

Estimate gives an idea of time required for the completion of the work.

Estimate is required to invite the tenders and Quotations and to arrange contract.

Estimate is also required to control the expenditure during the execution of work.

Estimate decides whether the proposed plan matches the funds available or not.

1.3.1. TYPES OF ESTIMATES

Prilimanry Estimate

Detailed estimate

Abstract

Revised Estimate

Prilimanary Estimate: The estimate is a rough estimate which is nornmally be estimated on approximate square feet rate. In this estimate the specifications and Area are only for the temparary purpose. Some times the cost may differ upto 50%.

Detailed Estimate: The estimate which is in detail be provided with specifcations of material, method of duing the work, Details measurements and drawings. The quantities of the item ofthe works may vary upto 10%

Abstract: The estimate which includes only the the total quantities of the item of works, Rates either as per PWD schedule or market values and total cost of the project

Revised Estimate: The revised estimate is the estimate which includes revised quantities or specifications and Rates.

The conditions for the preparation of Revised estimates are

1. When the area or measurements of the approved plan changes
2.When the specification of materialof method of construction changes 3.When the rates of the material, labour changes over and above 10%
4. When the location of the work changes

STEPS OR PROCEDURE OF ESTIMATION

Estimating involves the following operations

Preparing detailed Estimate.

Calculating the rate of each unit of work

Preparing abstract of estimate

REQUIR4MENTS TO PREPARE AN ESTIMATE

Drawings i.e. plans, elevations, sections etc. with complete measurements

Detailed Specifications if possible with brand name

Scheduled Rates or Market rates

DRAWINGS

If the drawings are not clear and without complete dimensions the preparation of estimation become very difficult. So, it is very essential before preparing an estimate

SPECIFICATIONS

General Specifications: This gives the nature, quality, class and work and materials in general terms to be used in various parts of wok. It helps no form a general idea of building.

Detailed Specifications: These gives the detailed description of the various items of work laying down the Quantities and qualities of materials, their proportions, the method of preparation workmanship and execution of work.

RATES

For preparing the estimate the unit rates of each item of work are required as given below

The rates of various materials to be used in the construction.

The cost of transport materials.

The wages of labor, skilled or unskilled of masons, carpenters, Amador, etc.,

LUMPSUM

While preparing an estimate, it is not possible to work out in detail in case of petty items. Items other than civil engineering such items are called lump sum items or simply L.S.Items.

The following are some of L.S. Items in the estimate.

Water supply and sanitaryarrangements.

Electrical installations like meter, motor, etc.,

Architectural features.

Contingencies and unforeseen items.

In general, certain percentage on the cost of estimation is allotted for the above L.S.Items Even if sub estimates prepared or at the end of execution of work, the actual cost should not exceed the L.S.amounts provided in the mainestimate.

WORK CHARGED ESTABLISHMENT:

During the construction of a project considerable number of skilled supervisors, work assistance, watch men etc., are employed on temporary basis. The salaries of these persons are drawn from the L.S. amount allotted towards the work charged establishment or in the category of contigencies

That is, establishment which is charged directly to work. An L.S.amount of 1½ to 2% of the estimated cost is provided towards the work charged establishment.

METHODS OF ESTIMATION

The quantities like earth work, foundation concrete, brickwork in plinthand super structure etc., can be workout by any of following two methods:

Long wall - short wall method

Centre line method.

Partly centre line and short wallmethod.

Cubical Contents Method

This method is generally used for multi-storeyed buildings. It is more accurate that the other two methods viz., plinth area method and unit base method. The cost of a structure is calculated approximately as the total cubical contents (Volume of buildings) multiplied by Local Cubic Rate. The volume of building is obtained by Length x breadth x depth or height. The length and breadth are measured out to out of walls excluding the plinth off set. The cost of string course, cornice, corbelling etc., is neglected. The cost of building= volume of buildings x rate/ unit volume.

Example 1 .1: Prepare an approximate estimate of building project with total plinth area of all building is 80 sqm. and from following data.

Plinth area rate Rs. 40000 per sqm

Cost of water supply @7½%of cost ofbuilding.

Cost of Sanitary andElectrical installations each @ 7½% of costofbuilding.

Cost of architectural features @1% of building cost.

Cost of roads and lawns @5% of building cost.

Cost of P.S. and contingencies @4% of building cost.

Determine the total cost of building project.

Solution:

Data given:

Plinth area = 80m2

Plinth area rate = Rs. 40000 per Sq.m

Cost of building = 80 x 40000 =	Rs. 32,00,000.00
Add the cost of water supply=7.5X3200000/100 =	+ Rs. 2,40,000.00
Add Cost of Sanitary& ElectricalInstallations=15x3200000/100=	+ Rs. 4,80,000.00
Add Architectural features= 1X3200000/100 =	+ Rs. 32,000.00
Add Cost of Roads and lawns=5X3200000/100=	+ Rs. 1,60,000.00
Add cost of P.S. & Contingencies=4X3200000/100=	+ Rs. 1,28,000.00
Total cost of the building=	Rs .42,40,000.00
Add Supervision charges 8%= 8X4240000/100	Rs. 3,39,200.00
Grand Total	**Rs.45,79,200.00**

Example 1.2 : Prepare the rough estimate for a proposed commercial complexfor a municipal corporation for the following data.

Plinth Area = 500m2/floor Ht of each storey = 3.5m No. of storey's = G+2

Cubical content rate = Rs. 1000/m3

Provided for a following as a percentage of structured cost

water supply & Sanitary arrangement-8%

Electrification -6%

Fluctuation of rates - 5%

Contractors profit - 10%

Petty supervision & contingencies - 3%

Sol :

Cubical content = No. of storey's (Plinth Area x height of each storey)

= 3(500x3.5) = 5250m3

Structural cost = Cubical content x cubical content rate= 5250 x 1000 = 52.5 Lakhs

Water supply installations=52.5X8/100		= 4.2 Lakhs
Electrification6%	=52.5X6/100	= 3.15 Lakhs

Fluctuation of rates	=52.5X5/100	= 2.625 lakhs
	Total	9.975 lakhs
Structural cost		=52.5 lakhs
Total cost		=62.475 lakhs
P S& contingencies =62.475X3/100=		=1.875 Lakhs
Contractor profit=62.475X10/100=		= 6.247 Lakhs
	Total cost =	70.596 lakhs

Unit Base Method

Example 1.3: Prepare an approximate estimate or rough cost estimate of ahospital building for 50 beds. The cost of construction altogether for each bed isRs. 60,000/ -. Determine the total cost of hospital building.

Solution:

No. of beds = 50

Cost of construction = Rs. 60,000/-

Total Cost of Hospital building = 50x 60,000= **Rs. 30,00,000/-**

Example 1.4: To prepare the rough cost estimate of a hostel building whichaccommodate 150 students. The cost of construction including all provisions isRs. 15,000/- per student. Determine total cost of building.

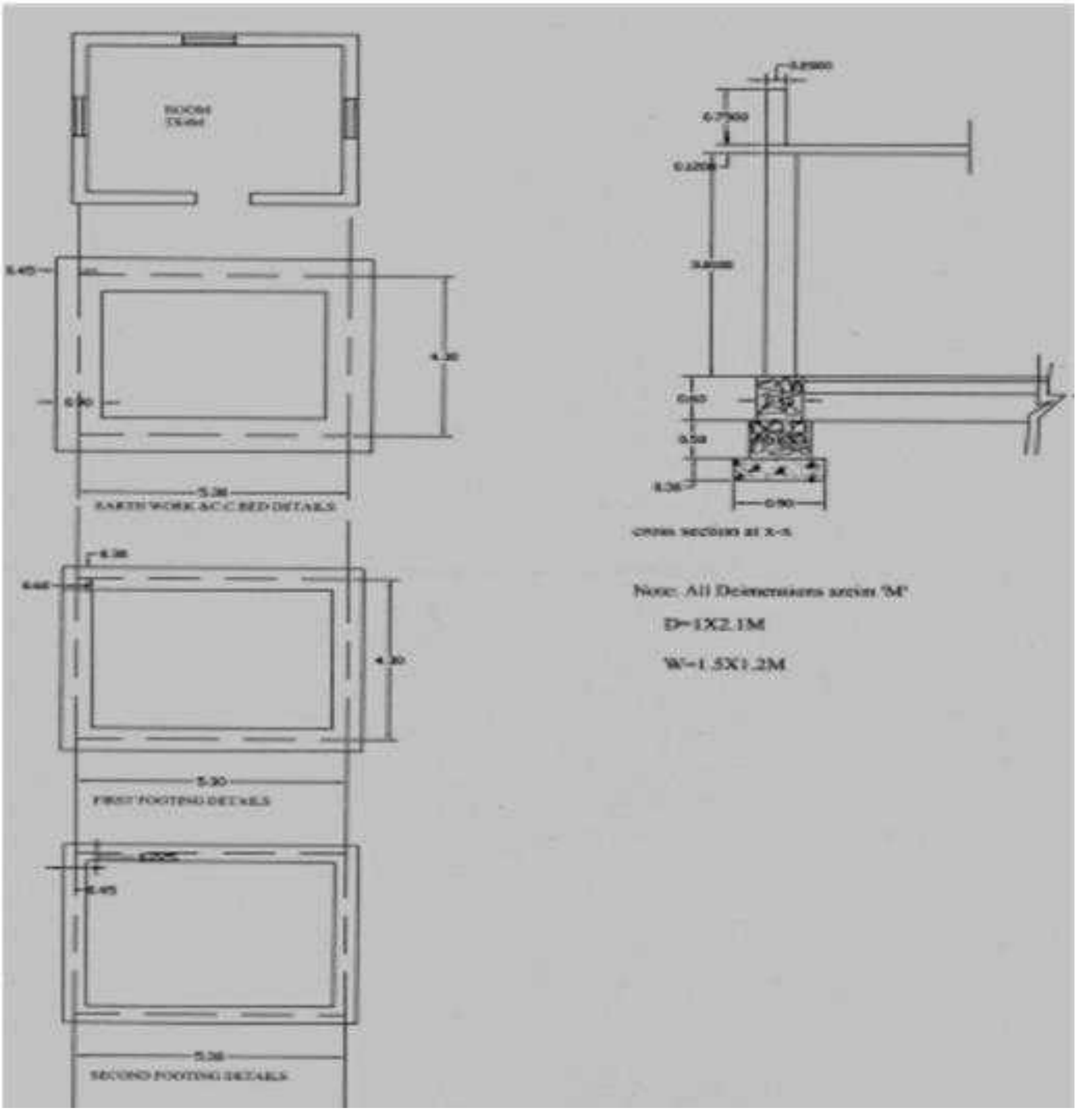
Solution :

No.of students= 150

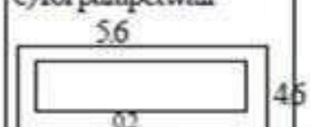
Cost of construction including all L.S. provisions = Rs. 15,000/- Total Cost of hostel building =150 x 15000 = Rs. 22,50,000/- (Rupees twenty two lakhs, fifty thousand only)

Example 1 . 5 : From the given figure below calculate the detailed and abstract estimate for the single roomed building (Load bearing type structure) bylong wall & short wall method

Centre Line Method



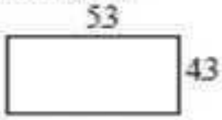
a) Long wall - Short Method

S.No.	Particulars of Items	No	L	B	H	Q	Explanation
1.	**Earth Work excavation** for foundation						
	a) Long walls	2	6.2	0.9	1.4	15.264	L=5.3+.45+.45=6.2 D=0.3+0.5+0.6=1.4
	b) Short walls	2	3.4	0.9	1.4	8.568	L=4.3-0.45-0.45=3.4
					Total	24.192	m^3
2.	**C.C.(1:4:8) bed for** foundation						
	a) Long walls	2	6.2	0.9	0.3	3.348	
	b) Short walls	2	3.4	0.9	0.3	1.836	
					Total	5.184	m^3
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings						
	i) Long walls	2	5.9	0.6	0.5	3.54	L=5.3+0.3+0.3=5.9
	ii) Short walls	2	3.7	0.6	0.5	2.22	L=4.3-0.3-0.3=3.7
					Total	5.76	m^3
	b) Basement						
	i) Long walls	2	5.75	0.45	0.6	3.105	L=5.3+0.225+0.225=5.75
	ii) Short walls	2	3.85	0.45	0.6	2.079	L=4.3-0.225-0.225=3.85
					Total	5.184	m^3
	Total R.R. Masonry for footings and Basement						
			= 5.76+5.184			**= 10.94 m^3**	
4.	**Brick masonary with CM** (1:6) for super structure						
	a) Long Walls	2	5.6	0.30	3.00	10.08	L=5.3+0.15+0.15=5.6
	b) Short walls	2	4.0	0.30	3.00	7.20	L=4.3-0.15-0.15=4.0
	c) for parapet wall						
							
	a) Long Walls	2	5.6	0.2	0.75	1.68	
	b) Short walls	2	4.4	0.2	0.75	1.32	
					Total	20.28	m^3

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
	Deductions for openings						
	a)Doors	1	1.0	0.3	2.1	0.63	
	b) Windows	3	1.5	0.3	1.2	1.62	
					Total	(-)2.25	m^3
	Net Brick Masonry		= 20.28 - 2.25 =			**18.03m^3**	
5.	**R.C.C. (1:2:4) for**						
	a) Roof slab	1	5.6	4.6	0.12	3.090	
	b) Lintels over						
	i) Doors	1	1.2	0.3	0.15	0.054	
	ii) Windows	3	1.5	0.3	0.15	0.202	
	c) Beams						
	i) Long beams	2	5.6	0.3	0.3	1.008	
	ii) short beams	2	4.0	0.3	0.3	0.720	
					Total	5.074	m^3
6.	**Sandfilling for basement**	1	4.85	3.85	0.48	8.96	L=5.0-0.075-0.075=4.85
7	**C.C.(1:4:8) for flooring**	1	4.85	3.85	0.1	1.86	B=4.0-0.075-0.075=3.85
8	**Flooring with Mosaic tiles**	1	5.0	4.0	--	20.0	m^2
9	**Plastering with CM (1:6)for super structure**						
	Inside						
	For walls	1	18.0	--	3.0	54.0	L=2(5.0+4.0)=18.0
	Out side						
	For walls	1	20.4	--	3.87	61.2	L=2(5.6+4.6)=20.4
	Basement outside	1	21.6	--	0.6	12.96	H=3.0+0.12+0.75=3.87
	Parapet wall						(upto parapet wall)
	a) Inside	1	18.8	--	0.75	14.1	
	b) top	1	19.6	0.2	---	3.92	
	Deductions for opeinings				Total	146.18	m^2
	Doors	1x2	1.0	--	2.1	4.2	
	Windows	3x2	1.5	--	1.2	10.8	
						15.0	m^2
	Net Plastering	= 146.18 - 15.0				= 131.18	m^2

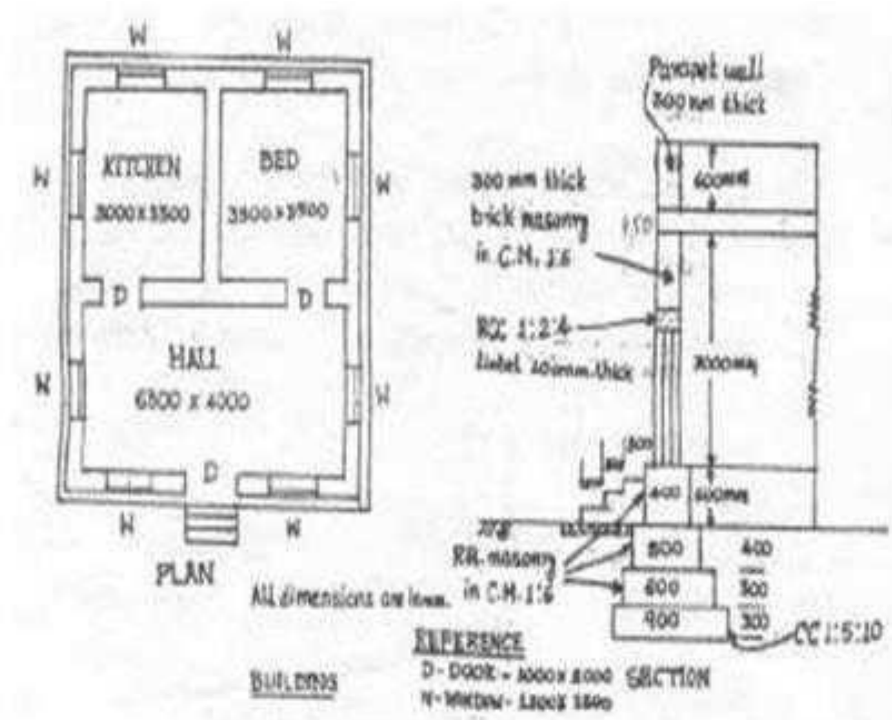
S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
10	Plastering for Ceiling with CM(1:5)	1	5.0	4.0	--	20.0	m^2
11	White Washing with two coats with Janatha cement						
	Same as quantity of plastering for walls and ceiling					151.18	(=131.18+20=151.18)
12.	Colour washing with two coats						
	Same as quantity of plastering for walls and ceiling					151.18	(=131.18+20)151.18)
13	Supply & Fixing of best country wood for						
	a) Doors	1				1 No.	
	b) Windows	3				3No.	
14	Painting with ready mixed synthetic enamil paits with two coats over primary coat for new wood for						
	a) Doors	2¼x1	1.0	---	2.1	4.725	
	b) Windows	2¼x3	1.5	---	1.2	12.15	
					Total	16.875	m^2
15	Petty supervision and contingencies at 4% and rounding off						

b) Centre Line Method

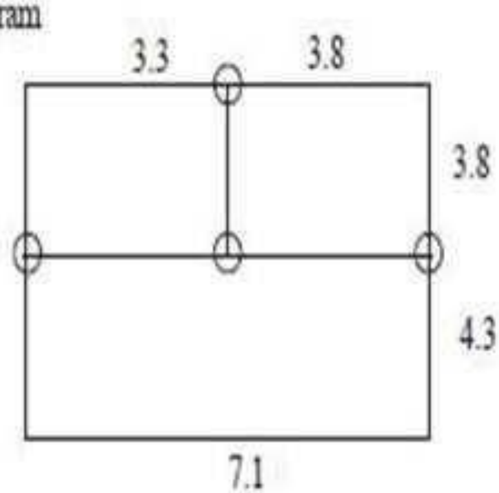
S.No.	Particulars of Items	No	L	B	H	Q	Explanation
1.	**Earth Work exevation**						
	for foundation	1	19.2	0.9	1.4	24.192	m^3
							L=2(5.3+4.3)=19.2
2.	**C.C.(1:4:8) bed for** foundation	1	19.2	0.9	0.3	5.184	m^3
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings	1	19.2	0.6	0.5	5.76	
	b) Basement	1	19.2	0.45	0.6	5.184	
					Total	10.944	
4.	**Brick masonry with**						
	CM (1:6) for super structure	1	19.2	0.3	3.0	17.28	m^3
	For parapet wall	1	20.0	0.2	0.75	3.00	
	Deductions for openings						
	a) Doors	1	1.0	0.3	2.1	0.63	
	b) Windows	3	1.5	0.3	1.2	1.62	
					Total	**(-)2.25**	m^3
	Net Brick Masonry =		**17.28+3.0-2.25 =**			**18.03**	m^3
5.	**R.C.C. (1:2:4) for**						
	a) roof slab	1	5.6	4.6	0.12	3.090	
	b) Lintels over						
	i) Doors	1	1.2	0.3	0.15	0.054	
	ii) Windows	3	1.5	0.3	0.15	0.202	
	c) beams	1	19.2	1.3	0.3	1.728	
					Total	5.074	m^3
6.	**Sandfilling for basement**	1	4.85	3.85	0.48	8.96	L=5.0-0.075-0.075=4.85
7	**C.C.(1:4:8) for flooring**	1	4.85	3.85	0.1	1.86	B=4.0-0.075-0.075=3.85

8.	**flooring with Mosaic tiles**	1	5.0	4.0	--	20.0	
9	**Plastering with CM (1:6)for super structure**						
	Inside						
	Forwalls	1	18.0	--	3.0	54.0	
	Out side						
	Forwalls	1	20.4	--	3.87	61.2	
	Basement outside	1	21.6	--	0.6	12.96	
	Parapet wall						
	a) Inside	1	18.8	--	0.75	14.1	
	b) top	1	19.6	0.2	---	3.92	
	Deductions for opeinings				Total	**146.18**	m^2
	Doors	1x2	1.0	--	2.1	4.2	L=5.0-0.075-0.075=4.85
	Windows	3x2	1.5	--	1.2	10.8	B=4.0-0.075-0.075=3.85
						15.0	m^2
	Net Plastering =	**146.18-15**		**=**		**131.18**	m^2
10	Plastering for Ceiling with CM(1:5)	1	5.0	4.0	--	20.0	m^2
11	White Washing with two coats with Janatha cement						
	Same as quantity of plastering for walls and ceiling					151.18	m^2 (131.18+20=151.18)
12.	Colour washing with two coats						
	Same as quantity of plastering for walls and ceiling					151.18	m^2
13	Supply & Fixing of best country wood for						
	a) Doors	1				1 No.	
	b) Windows	3				3No.	

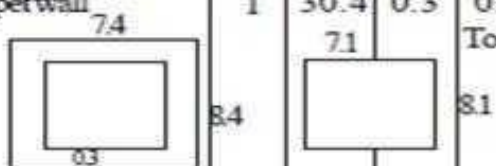
Example 1.6 From the given figure below calculate the details and abstractestimate for the single Storied residential buildingwith no of rooms (Load bearing type structure) by Centre line



Centre line diagram



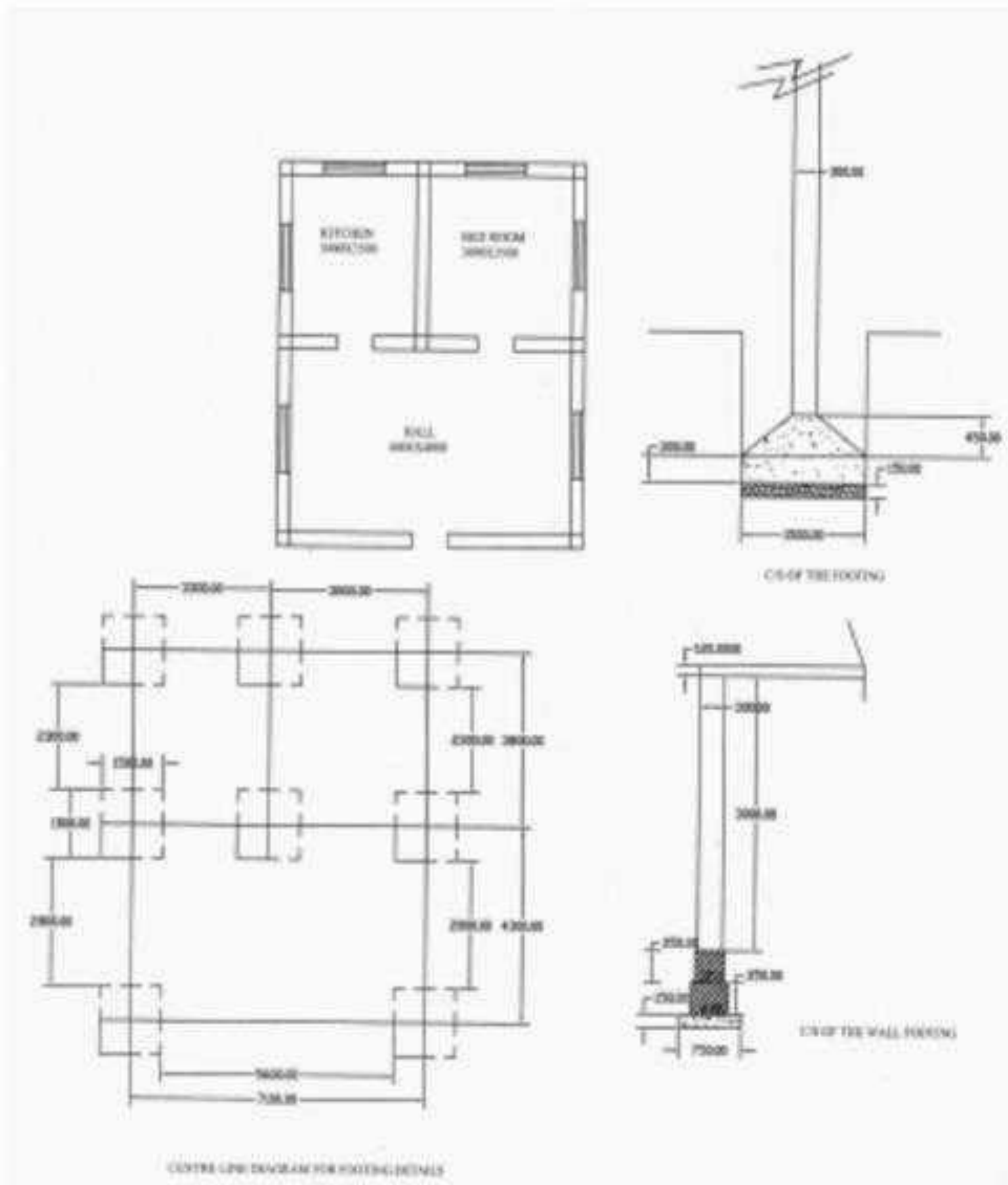
S.No.	Particulars of Items	No	L	B	H	Q	Explanation
1.	Earth work Excavation	1	39.5	0.9	1.0	35.55	41.3-4x0.9/2=39.5
2.	C.C. bed (1:5:10)	1	39.5	0.9	0.3	10.665	m^3
3.	R.R. Masonary in CM 1:6						
	1st Footing	1	40.1	0.6	0.3	7.218	41.3-4x0.6/2=40.1
	IInd Footing	1	40.3	0.5	0.4	8.06	41.3-4x0.5/2=40.3
	Basement	1	40.5	0.4	0.6	9.72	41.3-4x0.4/2=40.5
					Total	$\boxed{25.00}$	m^3
4.	Damp proof course over basement alround the building with CC (1:2:4)	1	40.5	0.6	---	16.2	m^2
	Deduct for Door sills	3	1.0	0.3		- 0.9	m^2
	Net Quantity =16.2-0.9=15.3 sq.m				---		
5.	First class brick work in wall in						
	a) superstructure with CM 1:6	1	40.7	0.3	3.0	36.63	L =41.3-4x0.3/2
	b) Parapet wall	1	30.4	0.3	0.6	5.472	L=2(7.1+8.1)
					Total	$\boxed{42.102}$	m^3



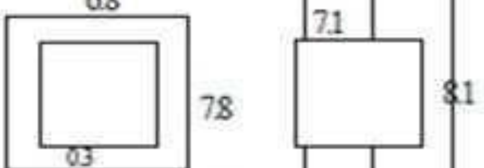
S.No.	Particulars of Items	No	L	B	H	Q	Explanation
	Deductions:						
	Doors	3	1.0	0.3	2.0	1.80	
	Windows	8	1.2	0.3	1.5	4.32	
	Lintel opening over						
	Doors	3	1.2	0.3	0.1	0.108	Asue 100mm
	Windows	8	1.4	0.3	0.1	0.336	projection on either
					Total	$\boxed{6.564}$	side
	Net Quantity of BM = 42.102-6.564 = 35.538m^3						
6.	Plastering with 12mm th in CM 1:5	1x2	40.1	---	3.0	240.6	L=41.3-4x0.3=40.1
	Deductions for openings						

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
	Doors	3x2	1.0	---	2.0	12.0	
	windows	8x2	1.2	---	1.5	28.8	
					Total	**40.8**	m^2
	Plastering for parapet wall (sides)	1x2	30.4	---	0.6	36.48	
	Top	1	30.4	0.3	---	9.12	
					Total	**45.60**	m^2
	Net Plastering = 240.6-40.8+45.6=245.4 m^2						
7.	Flooring with 25mm th CC(1:2:4)						
	Kitchen	1	3.0	3.5	--	10.5	
	Bed	1	3.5	3.5	--	12.25	
	Hall	1	6.8	4.0	--	27.20	
	Sills of Doors	3	1.0	0.3	--	0.90	
					Total	**50.85**	m^2
8.	Ceiling = Same as Flooring					50.85	m^2
9.	white washing = Same as Plastering for walls and ceiling 245.4+50.85 = 296.25 m^2						
10.	RCC(1:2:4) for						
	a) Slab	1	7.40	8.40	1.5	9.324	
	b) lintels over Doors	3	1.2	0.3	0.1	0.108	
	Windows	8	1.4	0.3	0.1	0.336	
	c) beams	1	40.7	0.3	0.3	3.663	
					Total	**13.431**	m^3
11	Supply & Fixing of best country wood for						
	a) Doors	3				3Nos.	
	b) Windows	8				8 Nos	
12	Painting with ready mixed synthetic enamil paints two coats over primary coat for new wood for						
	a) Doors	$2^1/_4$x3	1.0	--	2.0	13.50	
	b) Windows	$2^1/_4$x8	1.2	--	1.5	32.40	
						45.90	m^2
13	2% unforeseen items						
14	4% P.S & contingencies and round off						

Example 1.7 From the given figure below calculate the details and abstractestimate for the single storied residential building withno. of rooms (**Framed Structured** type) by Centre Line Method



S.No.	Particulars of Items	No	L	B	H	Q	Explanation
1	Earth work excavation for foundation for						
	a) pillars	8	1.5	1.5	1.80	32.4	
	b) around the building and cross walls	1	26.3	0.75	0.85	27.9	L= 5.6+2.8x2+ 2.3x3+(1.8+2.3)2
					Total	60.3	m^3
2.	C.C. (1:4:8) for						
	a) pillars	8	1.5	1.5	0.15	2.7	
	b) around the building and cross walls	1	38.3	0.75	0.15	4.3	L= 3.5x3+3x2+ 3.5x2+4x2+6.8=38.3
					Total	7.0	m^3
3.	Brick Masonry with C.M. (1:6) for						
	a) first footing	1	38.3	0.45	0.35	6.03	
	b) Second Footing	1	38.3	0.35	0.30	4.69	
	c) Superstructure	1	38.3	0.3	3.0	4.02	
	d) Parapet wall	1	30.4	0.3	0.6	5.47	L=(7.1+8.1)x2=30.4
					Total	20.21	m^3



S.No.	Particulars of Items	No	L	B	H	Q	Explanation
	Deduction for opening						
	a) Doors	3	1.0	0.3	2.0	1.8	
	b) Windows	8	1.2	0.3	1.5	4.32	
					Total	6.12	m^3
	Net Brick Masonry	=20.21-6.12			=	14.09	
4.	R.C.C.(1:1.5:3) for columns						
	a) Rectangular portion	8	1.5	1.5	0.3	5.40	
	b) Trepezoidal portion	8	0.9	0.9	0.45	2.92	
	c) Square portion upto GL	8	0.3	0.3	0.9	0.65	
	d) Square poriton above GL	8	0.3	0.3	3.0	2.16	
					Total	11.13	m^3
5.	Plastering with 12mm th in CM 1:5	1x2	40.1	---	3.0	240.6	L=41.3-4x0.3=40.1
	Deductions for openings						

S.No	Particulars of Items	No	L	B	H	Q	Explanation
	Doors	3x2	1.0	---	2.0	12.0	
	windows	8x2	1.2	---	1.5	28.8	
					Total	**40.8**	m^2
	Plastering for parapet wall (sides)	1x2	30.4	---	0.6	36.48	
	Top	1	30.4	0.3	---	9.12	
					Total	**45.60**	m^2
	Net Plastring = 240.6-40.8+45.6=245.4 m^2						
6.	Flooring with 25mm th CC(1:2:4)						
	Kitchen	1	3.0	3.5	--	10.5	
	Bed	1	3.5	3.5	--	12.25	
	Hall	1	6.8	4.0	--	27.20	
	Sills of Doors	3	1.0	0.3	--	0.90	
7.	Ceiling = Same as Flooring				Total	**50.85**	m^2
						50.85	
8.	white Washing = Same as Plastering for walls and ceiling 245.4+50.85 = 296.25 m^2						
9.	RCC(1:2:4) for						
	a) Slab	1	7.40	8.40	1.5	9.324	
	b) lintels over Doors	3	1.2	0.3	0.1	0.108	
	Windows	8	1.4	0.3	0.1	0.336	
	c) beams	1	40.7	0.3	0.3	3.663	
					Total	**13.431**	m^3
10	Supply & Fixing of best county wood for						
	a) Doors	3				3Nos.	
	b) Windows	8				8 Nos	
11	Painting with ready mixed synthetic enamil paints two coats over primary coat for new wood for						
	a) Doors	2¼x3	1.0	--	2.0	13.50	
	b) Windows	2¼x8	1.2	--	1.5	32.40	
						45.90	m^2
12	2% unforeseen items						
13	4% P.S& contingencies and round off.						

DEPARTMENT OF CIVIL ENGINEERING

SSSUTMS,SEHORE (M.P.)

DATE: 12/10/2021

NOTICE

All slow learner student appearing in III/V/VII Semester are hereby informed that remedial classes will be arranged from 18/10/2021 to 25/10/2021 for following subject. Students are required to attend the classes.

S.No.	Subject Name	Subject Code
1	Mathematics-I	BEBSC-101
2	Basic Civil Engineering & Mechanics	BEESC-205
3	Surveying	CEA-303
4	Building Planning & Architecture	CEA-304
5	Strength of material	CEA305
6	Structural Design & Drawing-I (RCC)	CEA503
7	Quantity Surveying & Costing	CEA-701
8	Environmental Engineering-II	CEA-702
9	Structural Design & Drawing-I (RCC-II)	CEA-703

HOD

CIVIL ENGINEERING DEPARTMENT

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES

[Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh]

Approved by Madhya Pradesh Private University Regulatory Commission

SH-18, Bhopal-Indore Road, Opposite Oilfed Plant, Pachama, Sehore (M.P.) Pin Code – 466001

Civil Engineering Department
Remedial Class Time Table
From 18/10/2021 to 25/10/2021

S.No.	Subject Code	Subject Name	Timing	Semester	Faculty Name
1	BEBSC-101	Mathematics-I	12:30pm to 1:30pm	I	Md. Sadab Ahmad
2	BEESC-205	Basic Civil Engineering & Mechanics	2:30pm to 3:30pm	I	Ms. Kamni Laheriya
3	CEA-303	Surveying	10:30am to 11:30am	III	Mr. Baldev Barde
4	CEA-304	Building Planning & Architecture	11:30am to 12:30pm	III	Mr. Babar Hussain
5	CEA305	Strength of material	12:30pm to 1:30pm	III	Mr. Tapas Singh
6	CEA503	Structural Design & Drawing-I (RCC)	11:30am to 12:30pm	V	Mr. Dharmendra Dangi
7	CEA-701	Quantity Surveying & Costing	12:30pm to 1:30pm	VII	Dr. Jayant Mishra
8	CEA-702	Environmental Engineering-II	2:30pm to 3:30pm	VII	Mr. Naveen Pathak
9	CEA-703	Structural Design & Drawing-I (RCC-II)	11:30am to 12:30pm	VII	Mr. Ravi Ramesh Patel

HOD
CIVIL ENGINEERING DEPARTMENT

Assignments

Subject Name & Code :- Mathematics-III (BEA-301)

1. Find the value of $ft = t \sin(at)$
2. Lagrange interpolation formula
3. Solve the following system

   $10x + 2y + z = 9$

   $2x + 20y - 2z = -44$

   $-2x + 3y + 10z = 22$

   by Gauss-Seidel method to two places of decimal.
4. If 10% of bolt's produced by a machine are defective. Determine the probability that out of 10 bolts, chosen at random

   i) 1

   ii) None

   iii) At most 2 bolts will be defective
5. Find the real root of the equation $x\log_{10} x = 1.2$ by bisection method correct to four decimal places

Assignments

Subject Name & Code :- Surveying (CEA-302)

1. Explain Tacheometry survey and its principle.
2. Explain the principles of surveying (Traversing) with the compass.
3. Discuss the effects of curvature and refraction in levelling. Find the correction due to each and the combined correction. Why are these effects ignored in ordinary levelling?
4. What is tangential method of tacheometry? What are its advantages and disadvantages over the stadia method?
5. A compound curve, consisting of two simple circular curves of radii 350 m and 500 m, is to be laid out between two straights. The angles of intersection between the tangents and the two straights are 25° and 55°. Calculate the various elements of the compound curve.
6. What is relief displacement in aerial photography? Explain

Assignments

Subject Name & Code :- Structural Design & Drawing-I (RCC-I) (CEA-503)

1. Differentiate between isolated and strap footing.
2. For an utimate axial load of 2000KN, design a column with i) circular section ii) square section
3. Find the moment of resistance of a beam 300mm x 500mm deep if it is reinforced with 4-12mm dia bars in the compression zone and 6-20mm dia bar in the tension zone, each at an effective cover of 40mm
4. Design a doubly rectangular beam for an effective span of 5m. The superimposed load is 60kN/m and size of the beam is limited to 23cm×45cm overall. Use M20 mi concrete and Fe 415 grade steel. Consider the exposure condition as moderate.
5. An R.C.C beam 250 mm×400 mm effective is carrying a uniformly distributed load of 16 kN/m. The beam is reinforced with 4 bars of 22 mm dia. The clear span of the beam is 4m. Design the shear reinforcement. Use M-20 and Fe-250.
6. Explain partial safety factor for load.
7. Explain system of forces and various types of loading.

Assignments

Subject Name & Code :- Quantity Surveying & Costing (CEA-701)

1. Explain the types of estimation.
2. Discuss the origin of the quantity surveyor and how the independent quantity surveyor came into being?
3. What are methods to be adopted for volume calculating
4. Estimate the quantities of brickwork and plastering required in a wall 4m long, 3m high and 30 cm thick. Calculate also the cost if the rate of brickwork is Rs.32.00 per cu.m and of plastering is Rs. 8.50 per sq.m
5. Write the duties of quantity surveyor.
6. Prepare analysis of rate for $1:1^1/_2:3$ reinforced cement concrete work in beams , slab etc.
7. Explain long wall short wall method in detail
8. First class brick work in cement mortar in super structure.
9. A newly constructed building stand on plot costing Rs. 130,000/-. The construction cost of the building is Rs.270, 000/- and estimated life is 70years. The investor decides to have 8% returns on his outlay. Annual repairs may be taken as 25% and the interest for sinking fund nay be taken as 4% calculate the monthly rent that will have to be charged for the building.
10. Write report to accompany an estimate for a residential for a executive engineer.
11. Find the plinth area required for the residential accommodation for an assistant Engineer in the pay scale of Rs.400.00 to 1,000 per month.
12. An old building has been purchased by a person at a cost of Rs.30,000/- excluding the cost of the land. Calculate the amount of annual sinking fund at 4% interest assuming the future life of the building as 20 years and scarp value of the building as 10% of the cost of purchase.
13. Workout the unit area rate for brickwork in cement mortar 1:6 using country burnt bricks for foundation and basement (For $1m^3$; brick 500nos; $0.24m^3$ sand; 58kg cement ; Labour :0.7brick masonry ;0.35man, 0.7 women ; rate : bricks Rs. 830/-per Nos ; sand Rs.70/-per $1.0m^3$ Cement Rs. 4000/- per tonne ; mason Rs.550/-; man Rs.475/-; women Rs 400/-

Assignments

Subject Name & Code :- Environmental Engineering-II (CEA-702)

1. Compare the design and working features of the slows and filter and rapid sand filter.
2. What is sedimentation and explain any two types of sedimentation tank?
3. If the 5 days BOD of a sample is 276 mg/l and ultimate BOD at the same temperature is 380 mg/l, at what rate the waste is oxidized?
4. A waste water treatment plant with a design flow of 50,000 m^3 /d has influent BOD 250 mg/l and effluent BOD of 10 mg/l. The Y (decimal fraction of food converted in kg to biomass kg) is 0.45. Endogenous decay coefficient kd = 0.05 d-1. Assumptions (MLSS = 2000 mg/l, under flow concentration from secondary clarifier = 9500 mg/l). Design a completely mixed activated sludge reactor, determine:
   i) Volume of reactor
   ii) Mass and Volume of solids that must be wasted each day
   iii) Recycle ratio
5. Highlight the advantages and disadvantages of 'Ultra filtration' and 'Micro filtration.
6. Explain the process of the formation and sloughing of the slime layer in trickling filters. Draw a neat diagram of high-rate trickling filter.

Assignments

Subject Name & Code :- Environmental Engineering-II (CEA-703)

1. A portal frame with ends hinged is to be analysed for the following data: Spacing of portal frames = 4.8m, Height of columns = 5m, distance between column centers = 10m, live load on roof = 2 kN/m 2. Find design moments.
2. Write down the different type of bracing used in multistorey building. Explain it's importance.
3. Design the top Dome, top ring beam and cylindrical wall of an intze tank. The dia. of tank is 8m and height of cylindrical wall is 4.5m. Use M-25 concrete and Fe-415 steel.
4. a) Explain Sway and Non Sway Building.
   b) Explain different type of Earth Retaining Structures.
5. Determine the eccentricity of loads in a 4 lane carriage way due to the following load cases- i) Single lane of class AA tracked loading ii) Two lanes of class AA wheeled vehicles.
6. Design the counter fort retaining wall to the following particulars:
   i) Height of wall above Ground Level = 8m
   ii) S.B.C. of soil = 18kN/m2
   iii) Angle of repose = 26º
   iv) Unit weight of fill = 16kN/m3
   v) Spacing of counterforts = 3.5m
   vi) Use M-25 grade concrete and Fe-500 grade steel.

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES

DEPT OF SCIENCE

B.Sc MID SEMESTER EXAMINATION[October 2021]

SN	ENROLLMENT	NAME	MAJOR		MINOR	ELECTIVE
			S1-COSC1T	S1COSC2T	S1-MATH2T	1-PHYS2T
			marks-30	marks-30	marks-30	marks-30
1	211717013001	GAURAV BOHARPI	27	28	28	14
2	211717013002	PRAKASH SINGH RAJPUT	14	28	28	13
3	211717013003	SHER SINGH SURYAVANSHI	28	28	28	12
4	211717013004	SOURAV DANGI	27	28	28	11
5	211717013005	GOVIND MEWADA	28	28	28	12
6	211717013006	PINTU VISHWAKARMA	12	24	22	15
7	211717013007	RIYAZ SHEKH	28	28	28	14
8	211717013008	RAMAN PREET SINGH	28	28	28	28
9	211717013009	SONU MEENA	12	24	28	14
10	211717013010	VIKASH MEENA	26	28	28	16
11	211717013011	NARGISH SHEKH	27	28	28	28
SN	ENROLLMENT	NAME	MAJOR		MINOR	ELECTIVE
			S1-MATH1T	S1-MATH2T	S1-PHYS2T	S1-CHEM2T
12	211717043001	RUCHI CHIDAR	27	28	28	28
13	211717043002	DIKSHA PANTHI	22	23	18	12
14	211717043003	MAYA MEWADA	28	28	28	28
15	211717043004	BHAGWAN SINGH MEWADA	27	28	28	12
16	211717043007	MANJUSHA NAMDEO	27	28	27	27
SN	ENROLLMENT	NAME	MAJOR		MINOR	ELECTIVE
			S1-BOTA1T	S1BOTA2T	S1-CHEM2T	S1-ZOOL2T
17	211717033001	SANJAY	27	28	14	28
18	211717033002	SONU MEWADA	28	28	28	28
19	211717033003	ANKIT MALVIYA	28	28	13	28
20	211717033004	SANDIP KALESHRIYA	27	28	24	28
21	211717033005	RACHANA VERMA	27	28	27	27

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& Medical Sciences Sehore

22	211717033006	ANAMIKA VISHWAKARMA	27	28	28	28
23	211717033007	MANSI RATHORE	28	28	28	28
24	211717033008	NIKITA MEWADA	28	28	28	28
25	211717033009	NIKITA GOUR	27	28	28	28
26	211717033010	SANJAY AHIRWAR	27	28	27	27
27	211717033011	NOSHAD AHEMAD	27	28	18	24
28	211717033012	NEERAJ SAGWALIYA	25	24	18	25
29	211717033013	AAKASH	16	14	18	14
30	211717033014	RAVI BAGHEL	27	28	28	28
31	211717033015	NISHAD SHIVAM MANOJ	27	28	27	27
32	211717033016	MONIKA MEWADA	27	28	28	28
33	211717033017	AMIT SINGH BAGHEL	28	28	28	28
34	211717033018	VIDHYA	28	28	28	28
35	211717033019	SWATI PARMAR	27	28	28	28
36	211717033020	NAVEEN SINGH GURJAR	27	28	27	27
37	211717033021	ANIL JAISWAL	27	28	28	28
38	211717033022	ARJUN SINGH GURJAR	28	28	28	28
39	211717033023	GOURAV SHARMA	28	28	28	28
40	211717033024	SAKCHAM TIWARI	27	28	28	28
SN	**ENROLLMENT**	**NAME**	**MAJOR**		**MINOR**	**ELECTIVE**
			S1-MBIO1T	S1-MBIO2T	**S1-ZOOL2T**	S1-CHEM2T
41	211717053001	KAMLESH	27	28	28	–
42	211717053002	MEHUL BICHPURIYA	28	28	28	–
43	211717053003	PRATIBHA MANDLOI	28	28	14	28

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES

DEPT OF SCIENCE

BCA MID SEMESTER EXAMINATION[October 2021]

			Major		Minor	General Elective	
Srlno	**Enrollment No**	**Candidate Name**	S1-BCAA1T	S1-BCAA2T	S1-BCAB2T	S1-BCAD2G	S1-COAP2G
1	211713013001	TARUN AHUJA	26	25	24	26	
2	21171301300	NIKUNJ JAIN	25	23	26	24	

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	2						
3	211713013003	SONTHI SRIHARSHA	24	23	25	24	
4	211713013004	JEEVAN THAKUR	26	27	25	24	
5	211713013005	AMAN JAMLIYA	23	24	25	25	
6	211713013006	NAKUL VERMA	25	23	26	24	
7	211713013025	DHANANJAY NAMDEV	12	24	26	24	
8	211713013026	DIBYAHAH DAS	13	26	24	24	
9	211713013027	SHAFWAN	14	25	24		22
10	211713013019	VAIBHAV TYAGI	24	25	24	-	25
11	211713013020	KHUSHI RATHORE	25	24	26	23	
12	211713013021	ASHISH YADAV	24	25	25	24	
13	211713013022	RAJNEESH MEWADA	23	25	26	23	
14	211713013023	PRAGYA SEN	25	23	24	25	
15	211713013024	HEMANT RAMRAKHIYANI	25	24	23	25	
16	211713013013	HARSHWARDHARN VERMA	24	24	26	26	
17	211713013014	SANJEEV MEWADA	23	24	25	26	
18	211713013015	VINAY PATIDAR	26	25	24	_	26
19	211713013016	AMIT MEWADA	23	24	25	25	
20	211713013017	NEERAJ VERMA	25	25	24	24	
21	211713013018	SHREYANSH TAMRAKAR	12	24	25		24
22	211713013007	RONAK RATHOR	25	25	25	24	
23	211713013008	AMIT PARMAR	23	24	25	24	
24	211713013009	ANIL GOUR	24	25	26	23	
25	211713013010	ANURAG PARMAR	24	25	25	26	

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Remedial Classes -Time Table 2021

Course: B.Sc./BCA

I Year

Days	CLASS	09:50 AM- 10:40 AM	10:40 AM- 11:30 AM	11:30 AM- 12:20 PM	12:20 PM- 1:10 PM
SATURDAY	BSC CS	S1-COSC1T			1-PHYS2T
	BSC MATHS			S1-PHYS2T	S1-CHEM2T
	BSC BIO			S1-CHEM2T	
	BSC MICRO				S1-CHEM2T
	BCA	S1-BCAA1T			

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Faculty of Education

Branch – BSC CS / BCA

Subject Name – Computer fundamental & Architecture

Created by- Abhishek Kuroliya (CS Dept.)

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Number System : The technique to represent and work with numbers is called **number system**. **Decimal number system** is the most common number system. Other popular number systems include **binary number system, octal number system, hexadecimal number system,** etc.

1. Decimal Number System

Decimal number system is a **base 10** number system having 10 digits from 0 to 9. This means that any numerical quantity can be represented using these 10 digits.

2. Binary Number System

The easiest way to vary instructions through electric signals is two-state system – on and off. On is represented as 1 and off as 0, though 0 is not actually no signal but signal at a lower voltage. The number system having just these two digits – 0 and 1 – is called **binary number system**.

Example :

And decimal equivalent of this number is sum of product of each digit with its positional value.

$11010_2 = 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$

$= 16 + 8 + 0 + 2 + 0$

$= 26_{10}$

3.Octal Number System

Octal number system has eight digits – 0, 1, 2, 3, 4, 5, 6 and 7. Octal number system is also a positional value system with where each digit has its value expressed in powers of 8.

Example:

Decimal equivalent of any octal number is sum of product of each digit with its positional value.

$726_8 = 7\times8^2 + 2\times8^1 + 6\times8^0$

$= 448 + 16 + 6$

$= 470_{10}$

4.Hexadecimal Number System

Octal number system has 16 symbols – 0 to 9 and A to F where A is equal to 10, B is equal to 11 and so on till F. Hexadecimal number system is also a positional value system with where each digit has its value expressed in powers of 16.

Example:

Decimal equivalent of any hexadecimal number is sum of product of each digit with its positional value.

$27FB_{16} = 2\times16^3 + 7\times16^2 + 15\times16^1 + 10\times16^0$

$= 8192 + 1792 + 240 +10$

$= 10234_{10}$

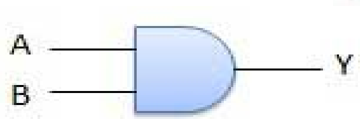
Logic gates

Logic gates are the basic building blocks of any digital system. It is an electronic circuit having one or more than one input and only one output. The relationship between the input and the output is based on a **certain logic**. Based on this, logic gates are named as AND gate, OR gate, NOT gate etc.

AND Gate

A circuit which performs an AND operation is shown in figure. It has n input (n >= 2) and one output.

Logic diagram



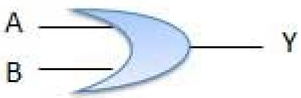
Truth Table

Inputs		Output
A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

A circuit which performs an OR operation is shown in figure. It has n input (n >= 2) and one output.

Logic diagram



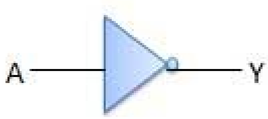
Truth Table

Inputs		Output
A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1

NOT Gate

NOT gate is also known as **Inverter**. It has one input A and one output Y.

Logic diagram



Truth Table

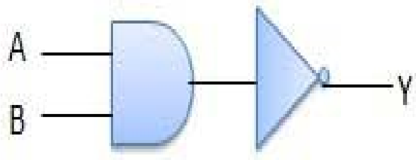
Inputs	Output
A	B
0	1
1	0

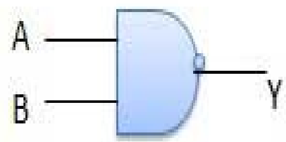
NAND Gate

A NOT-AND operation is known as NAND operation. It has n input (n >= 2) and one output.

Y	=	A NOT AND B NOT AND C .... N
Y	=	A NAND B NAND C .... N

Logic diagram





Truth Table

Inputs		Output
A	B	$\overline{AB}$
0	0	1
0	1	1
1	0	1
1	1	0

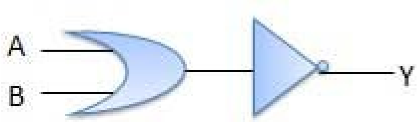
NOR Gate

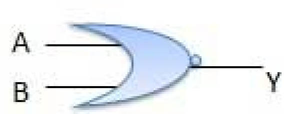
A NOT-OR operation is known as NOR operation. It has n input (n >= 2) and one output.

Y = A NOT OR B NOT OR C .... N

Y = A NOR B NOR C .... N

Logic diagram





Truth Table

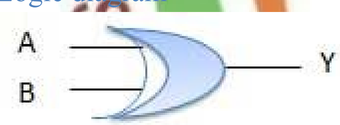
Inputs		Output
A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

XOR Gate

XOR or Ex-OR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-OR gate is abbreviated as EX-OR gate or sometime as X-OR gate. It has n input (n >= 2) and one output.

$$Y = A \text{ XOR } B \text{ XOR } C \ldots\ldots N$$
$$Y = A \oplus B \oplus C \ldots\ldots N$$
$$Y = \overline{A}B + A\overline{B}$$

Logic diagram



Truth Table

Inputs		Output
A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

XNOR Gate

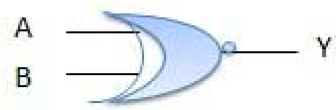
XNOR gate is a special type of gate. It can be used in the half adder, full adder and subtractor. The exclusive-NOR gate is abbreviated as EX-NOR gate or sometime as X-NOR gate. It has n input (n >= 2) and one output.

$Y = A \text{ XOR } B \text{ XOR } C \ldots\ldots N$

$Y = A \odot B \odot C \ldots\ldots N$

$Y = \bar{A}\bar{B} + AB$

Logic diagram



Truth Table

Inputs		Output
A	B	$A \odot B$
0	0	1
0	1	0
1	0	0
1	1	1

Boolean Algebra is an algebra, which deals with binary numbers & binary variables. Hence, it is also called as Binary Algebra or logical Algebra. A mathematician, named George Boole had developed this algebra in 1854. The variables used in this algebra are also called as Boolean variables.

The range of voltages corresponding to Logic 'High' is represented with '1' and the range of voltages corresponding to logic 'Low' is represented with '0'.

Postulates and Basic Laws of Boolean Algebra

In this section, let us discuss about the Boolean postulates and basic laws that are used in Boolean algebra. These are useful in minimizing Boolean functions.

Boolean Postulates

Consider the binary numbers 0 and 1, Boolean variable xx and its complement x′x′. Either the Boolean variable or complement of it is known as **literal**. The four possible **logical OR** operations among these literals and binary numbers are shown below.

$$x + 0 = x$$

$$x + 1 = 1$$

$$x + x = x$$

$$x + x' = 1$$

Similarly, the four possible **logical AND** operations among those literals and binary numbers are shown below.

$$x.1 = x$$

$$x.0 = 0$$

$$x.x = x$$

$$x.x' = 0$$

These are the simple Boolean postulates. We can verify these postulates easily, by substituting the Boolean variable with '0' or '1'.

Binary Code :In the coding, when numbers, letters or words are represented by a specific group of symbols, it is said that the number, letter or word is being encoded. The group of symbols is called as a code. The digital data is represented, stored and transmitted as group of binary bits. This group is also called as **binary code**. The binary code is represented by the number as well as alphanumeric letter.

Advantages of Binary Code

Following is the list of advantages that binary code offers.

- Binary codes are suitable for the computer applications.
- Binary codes are suitable for the digital communications.
- Binary codes make the analysis and designing of digital circuits if we use the binary codes.
- Since only 0 & 1 are being used, implementation becomes easy.

Classification of binary codes

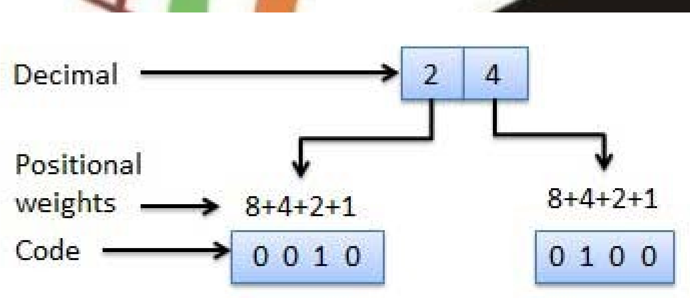
The codes are broadly categorized into following four categories.

- Weighted Codes
- Non-Weighted Codes
- Binary Coded Decimal Code

- Alphanumeric Codes
- Error Detecting Codes
- Error Correcting Codes

Weighted Codes

Weighted binary codes are those binary codes which obey the positional weight principle. Each position of the number represents a specific weight. Several systems of the codes are used to express the decimal digits 0 through 9. In these codes each decimal digit is represented by a group of four bits.



Non-Weighted Codes

In this type of binary codes, the positional weights are not assigned. The examples of non-weighted codes are Excess-3 code and Gray code.

Excess-3 code

The Excess-3 code is also called as XS-3 code. It is non-weighted code used to express decimal numbers. The Excess-3 code words are derived from the 8421 BCD code words adding $(0011)_2$ or (3)10 to each code word in 8421. The excess-3 codes are obtained as follows −

Decimal Number $\longrightarrow$ 8421 BCD $\xrightarrow[0011]{\text{Add}}$ Excess-3

Example

Decimal	BCD 8 4 2 1	Excess-3 BCD + 0011
0	0 0 0 0	0 0 1 1
1	0 0 0 1	0 1 0 0
2	0 0 1 0	0 1 0 1
3	0 0 1 1	0 1 1 0
4	0 1 0 0	0 1 1 1
5	0 1 0 1	1 0 0 0
6	0 1 1 0	1 0 0 1
7	0 1 1 1	1 0 1 0
8	1 0 0 0	1 0 1 1
9	1 0 0 1	1 1 0 0

Gray Code

It is the non-weighted code and it is not arithmetic codes. That means there are no specific weights assigned to the bit position. It has a very special feature that, only one bit will change each time the decimal number is incremented as shown in fig. As only one bit changes at a time, the gray code is called as a unit distance code. The gray code is a cyclic code. Gray code cannot be used for arithmetic operation.

Decimal	BCD	Gray
0	0 0 0 0	0 0 0 0
1	0 0 0 1	0 0 0 1
2	0 0 1 0	0 0 1 1
3	0 0 1 1	0 0 1 0
4	0 1 0 0	0 1 1 0
5	0 1 0 1	0 1 1 1
6	0 1 1 0	0 1 0 1
7	0 1 1 1	0 1 0 0
8	1 0 0 0	1 1 0 0
9	1 0 0 1	1 1 0 1

Application of Gray code

- Gray code is popularly used in the shaft position encoders.
- A shaft position encoder produces a code word which represents the angular position of the shaft.

Binary Coded Decimal (BCD) code

In this code each decimal digit is represented by a 4-bit binary number. BCD is a way to express each of the decimal digits with a binary code. In the BCD, with four bits we can represent sixteen numbers (0000 to 1111). But in BCD code only first ten of these are used (0000 to 1001). The remaining six code combinations i.e. 1010 to 1111 are invalid in BCD.

Decimal	0	1	2	3	4	5	6	7	8	9
BCD	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

Advantages of BCD Codes

- It is very similar to decimal system.
- We need to remember binary equivalent of decimal numbers 0 to 9 only.

Disadvantages of BCD Codes

- The addition and subtraction of BCD have different rules.
- The BCD arithmetic is little more complicated.
- BCD needs more number of bits than binary to represent the decimal number. So BCD is less efficient than binary.

Alphanumeric codes

A binary digit or bit can represent only two symbols as it has only two states '0' or '1'. But this is not enough for communication between two computers because there we need many more symbols for communication. These symbols are required to represent 26 alphabets with capital and small letters, numbers from 0 to 9, punctuation marks and other symbols.

The alphanumeric codes are the codes that represent numbers and alphabetic characters. Mostly such codes also represent other characters such as symbol and various instructions necessary for conveying information. An alphanumeric code should at least represent 10 digits and 26 letters of alphabet i.e. total 36 items. The following three alphanumeric codes are very commonly used for the data representation.

- American Standard Code for Information Interchange (ASCII).
- Extended Binary Coded Decimal Interchange Code (EBCDIC).
- Five bit Baudot Code.

ASCII code is a 7-bit code whereas EBCDIC is an 8-bit code. ASCII code is more commonly used worldwide while EBCDIC is used primarily in large IBM computers.

Flip-Flops:basic building blocks of flip-flops. We can implement flip-flops in two methods.

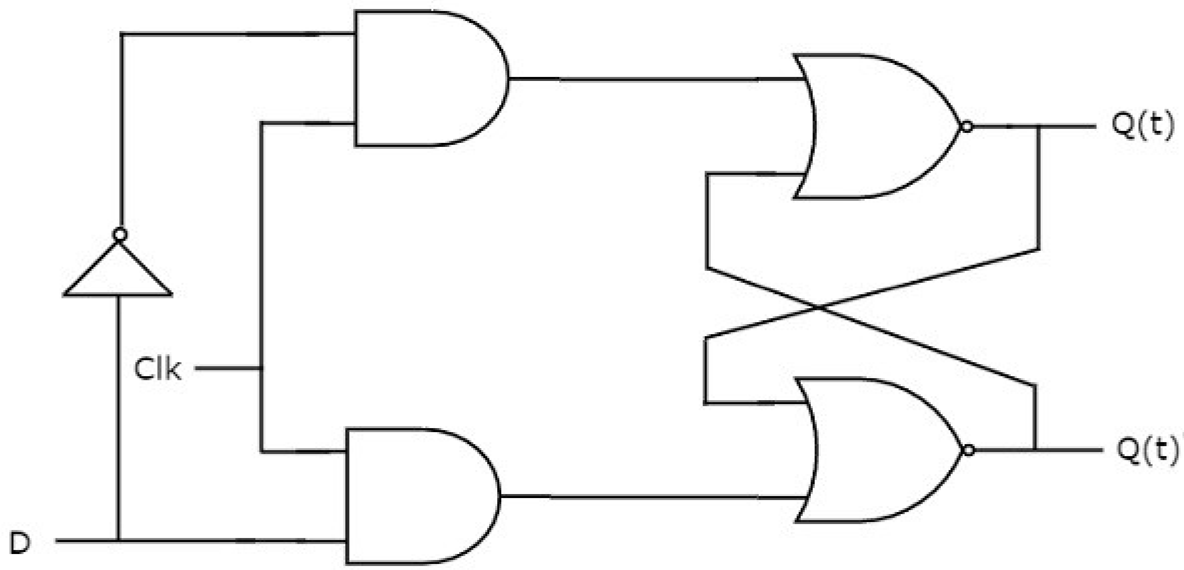
In first method, **cascade two latches** in such a way that the first latch is enabled for every positive clock pulse and second latch is enabled for every negative clock pulse. So that the combination of these two latches become a flip-flop.

In second method, we can directly implement the flip-flop, which is edge sensitive. In this chapter, let us discuss the following **flip-flops** using second method.

- D Flip-Flop
- JK Flip-Flop
- T Flip-Flop

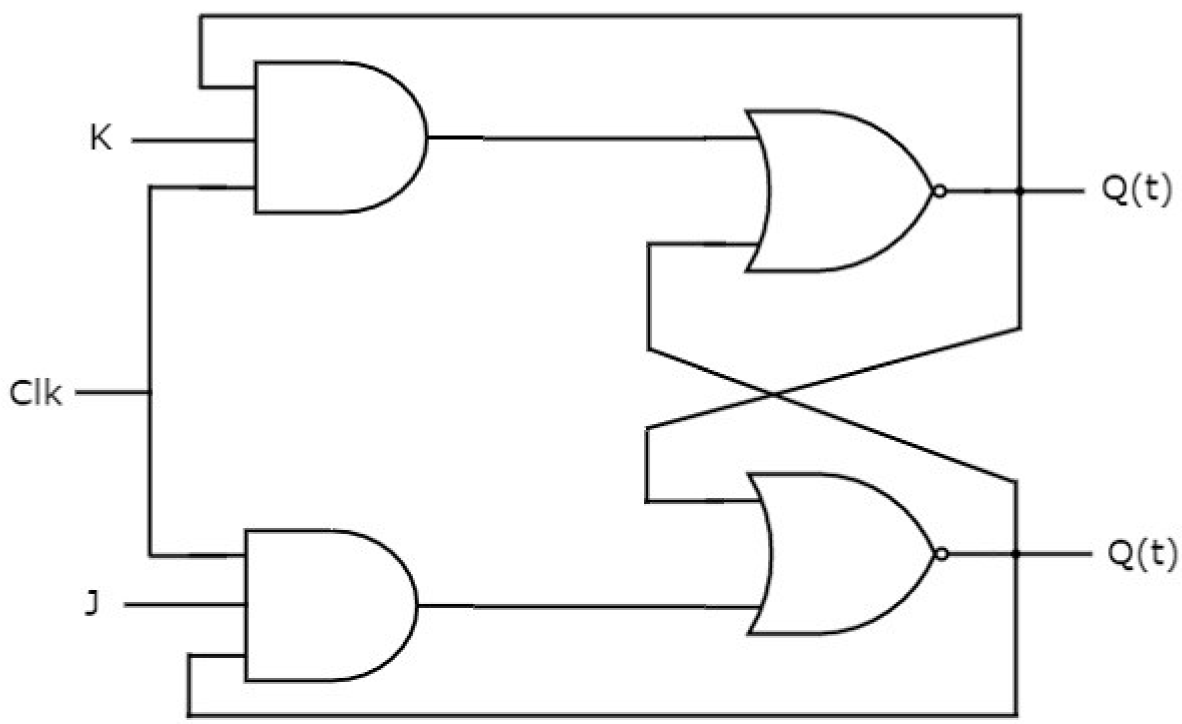
D Flip-Flop

D flip-flop operates with only positive clock transitions or negative clock transitions. Whereas, D latch operates with enable signal. That means, the output of D flip-flop is insensitive to the changes in the input, D except for active transition of the clock signal. The **circuit diagram** of D flip-flop is shown in the following figure.



K Flip-Flop

JK flip-flop is the modified version of SR flip-flop. It operates with only positive clock transitions or negative clock transitions. The **circuit diagram** of JK flip-flop is shown in the following figure.



Half Adder

Half adder is a combinational circuit, which performs the addition of two binary numbers A and B are of **single bit**. It produces two outputs sum, S & carry, C.

The **Truth table** of Half adder is shown below.

Inputs		Outputs	
A	B	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

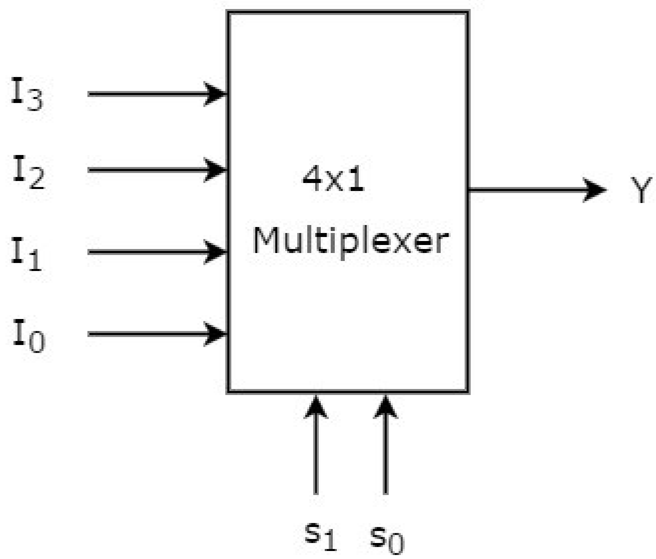
Multiplexer:

Multiplexer is a combinational circuit that has maximum of 2^n data inputs, 'n' selection lines and single output line. One of these data inputs will be connected to the output based on the values of selection lines.

Since there are 'n' selection lines, there will be 2^n possible combinations of zeros and ones. So, each combination will select only one data input. Multiplexer is also called as **Mux**.

4x1 Multiplexer

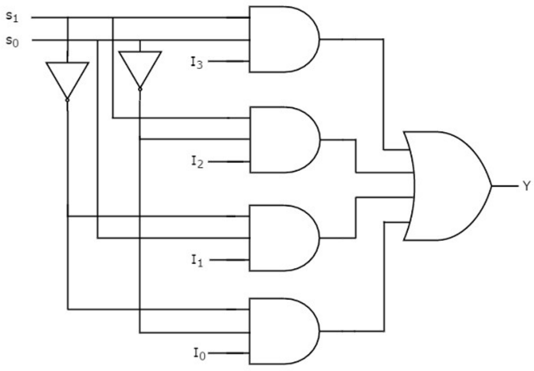
4x1 Multiplexer has four data inputs I_3, I_2, I_1 & I_0, two selection lines s_1 & s_0 and one output Y. The **block diagram** of 4x1 Multiplexer is shown in the following figure.



One of these 4 inputs will be connected to the output based on the combination of inputs present at these two selection lines. **Truth table** of 4x1 Multiplexer is shown below.

Selection Lines		**Output**
S_1	**S_0**	**Y**
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

We can implement this Boolean function using Inverters, AND gates & OR gate. The **circuit diagram** of 4x1 multiplexer is shown in the following figure.

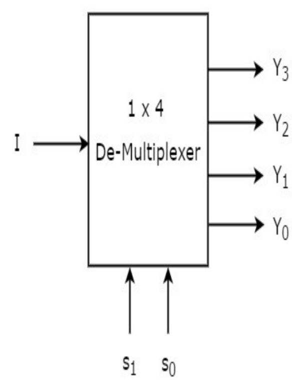


De-Multiplexer is a combinational circuit that performs the reverse operation of Multiplexer. It has single input, ‘n’ selection lines and maximum of 2^n outputs. The input will be connected to one of these outputs based on the values of selection lines.

Since there are ‘n’ selection lines, there will be 2^n possible combinations of zeros and ones. So, each combination can select only one output. De-Multiplexer is also called as **De-Mux**.

1x4 De-Multiplexer

1x4 De-Multiplexer has one input I, two selection lines, s_1 & s_0 and four outputs Y_3, Y_2, Y_1 &Y_0. The **block diagram** of 1x4 De-Multiplexer is shown in the following figure.



The single input ‘I’ will be connected to one of the four outputs, Y_3 to Y_0 based on the values of selection lines s_1 & s0. The **Truth table** of 1x4 De-Multiplexer is shown below.

Selection Inputs		Outputs			
S_1	S_0	Y_3	Y_2	Y_1	Y_0

0	0	0	0	0	**I**
0	1	0	0	**I**	0
1	0	0	**I**	0	0
1	1	**I**	0	0	0

From the above Truth table, we can directly write the **Boolean functions** for each output a.

Memory :

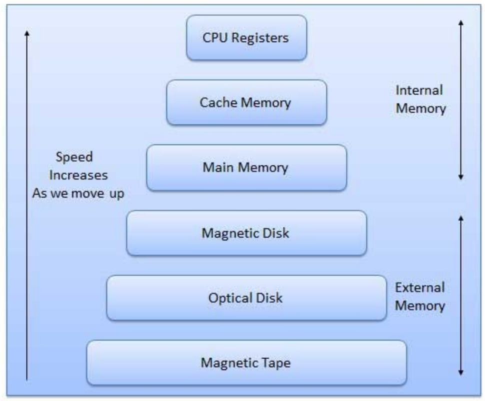
A memory is just like a human brain. It is used to store data and instruction. Computer memory is the storage space in computer where data is to be processed and instructions required for processing are stored.

The memory is divided into large number of small parts. Each part is called a cell. Each location or cell has a unique address which varies from zero to memory size minus one.

For example if computer has 64k words, then this memory unit has 64 * 1024 = 65536 memory location. The address of these locations varies from 0 to 65535.

Memory is primarily of two types

- **Internal Memory** − cache memory and primary/main memory
- **External Memory** − magnetic disk / optical disk etc.



Characteristics of Memory Hierarchy are following when we go from top to bottom.

- Capacity in terms of storage increases.
- Cost per bit of storage decreases.
- Frequency of access of the memory by the CPU decreases.
- Access time by the CPU increases.

RAM

A RAM constitutes the internal memory of the CPU for storing data, program and program result. It is read/write memory. It is called random access memory (RAM).

Since access time in RAM is independent of the address to the word that is, each storage location inside the memory is as easy to reach as other location & takes the same amount of time. We can reach into the memory at random & extremely fast but can also be quite expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup uninterruptible power system (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power remains applied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not have to be refreshed on a regular basis.

Because of the extra space in the matrix, SRAM uses more chips than DRAM for the same amount of storage space, thus making the manufacturing costs higher.

Static RAM is used as cache memory needs to be very fast and small.

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually **refreshed** in order for it to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory because it is cheap and small. All DRAMs are made up of memory cells. These cells are composed of one capacitor and one transistor.

ROM

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture.

A ROM, stores such instruction as are required to start computer when electricity is first turned on, this operation is referred to as bootstrap. ROM chip are not only used in the computer but also in other electronic items like washing machine and microwave oven.

Following are the various types of ROM −

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs. It is inexpensive ROM.

PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM programmer. Inside the PROM chip there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory)

The EPROM can be erased by exposing it to ultra-violet light for a duration of upto 40 minutes. Usually, an EPROM eraser achieves this function. During programming an electrical charge is trapped in an insulated gate region. The charge is retained for more than ten years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of re-programming is flexible but slow.

Serial Access Memory

Sequential access means the system must search the storage device from the beginning of the memory address until it finds the required piece of data. Memory device which supports such access is called a Sequential Access Memory or Serial Access Memory. Magnetic tape is an example of serial access memory.

Direct Access Memory

Direct access memory or Random Access Memory, refers to conditions in which a system can go directly to the information that the user wants. Memory device which supports such access is called a Direct Access Memory. Magnetic disks, optical disks are examples of direct access memory.

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory. It is used to hold those parts of data and program which are most frequently used by CPU. The parts of data and programs, are transferred from disk to cache memory by operating system, from where CPU can access them.

Advantages

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantages

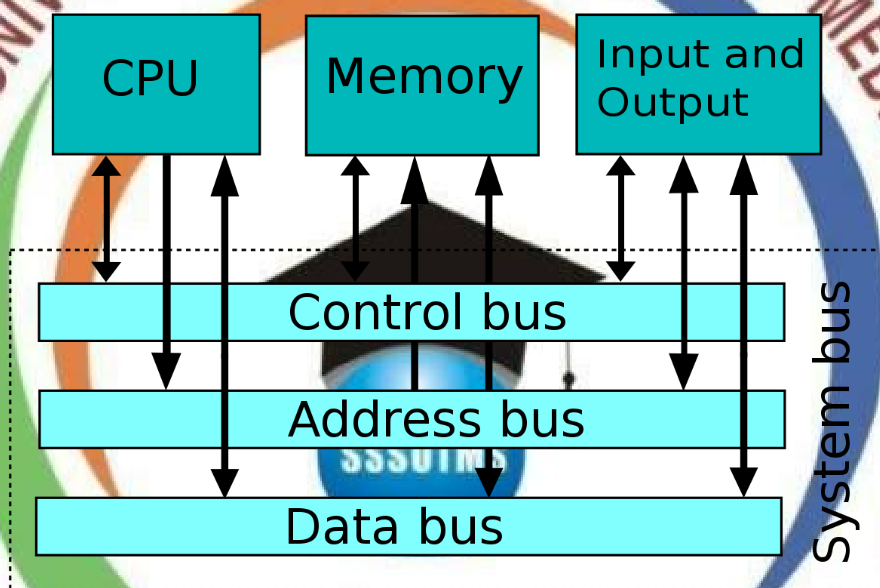
- Cache memory has limited capacity.
- It is very expensive.

Virtual memory is a technique that allows the execution of processes which are not completely available in memory. The main visible advantage of this scheme is that programs can be larger than physical memory. Virtual memory is the separation of user logical memory from physical memory.

This separation allows an extremely large virtual memory to be provided for programmers when only a smaller physical memory is available. Following are the situations, when entire program is not required to be loaded fully in main memory.

- User written error handling routines are used only when an error occurred in the data or computation.
- Certain options and features of a program may be used rarely.

- Many tables are assigned a fixed amount of address space even though only a small amount of the table is actually used.
- The ability to execute a program that is only partially in memory would counter many benefits.
- Less number of I/O would be needed to load or swap each user program into memory.
- A program would no longer be constrained by the amount of physical memory that is available.
- Each user program could take less physical memory, more programs could be run the same time, with a corresponding increase in CPU utilization and throughput.



What is a computer bus?

A bus is a communication system in computer architecture that transfers data between components inside a computer, or between computers.

The term encompasses all the components related to hardware (wire, optical fiber, etc.) and software, including communication protocol.
The following are a few points to describe a computer bus:-

- A bus is a group of lines/wires which carry computer signals.
- A bus is the means of shared transmission.
- Lines are assigned for providing descriptive names. — carries a single electrical signal, e.g. 1-bit memory address, data bits series, or timing control that turns the device on or off.

- Data can be transferred from one computer system location to another (between different I / O modules, memory, and CPU).
- The bus is not only cable but also hardware (bus architecture), protocol, program, and bus controller.

Registers:

Flip-flop is a 1 bit memory cell which can be used for storing the digital data. To increase the storage capacity in terms of number of bits, we have to use a group of flip-flop. Such a group of flip-flop is known as a Register. The n-bit register will consist of n number of flip-flop and it is capable of storing an n-bit word.

The binary data in a register can be moved within the register from one flip-flop to another. The registers that allow such data transfers are called as shift registers. There are four mode of operations of a shift register.

- Serial Input Serial Output
- Serial Input Parallel Output
- Parallel Input Serial Output
- Parallel Input Parallel Output

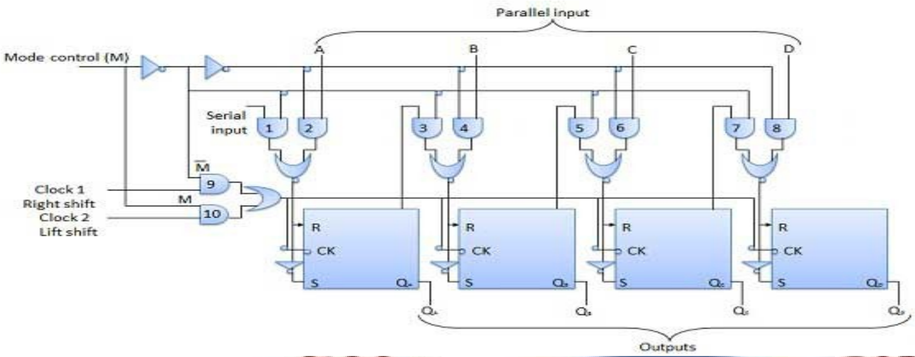
Universal Shift Register

A shift register which can shift the data in only one direction is called a uni-directional shift register. A shift register which can shift the data in both directions is called a bi-directional shift register. Applying the same logic, a shift register which can shift the data in both directions as well as load it parallelly, is known as a universal shift register. The shift register is capable of performing the following operation −

- Parallel loading
- Left Shifting
- Right shifting

The mode control input is connected to logic 1 for parallel loading operation whereas it is connected to 0 for serial shifting. With mode control pin connected to ground, the universal shift register acts as a bi-directional register. For serial left operation, the input is applied to the serial input which goes to AND gate-1 shown in figure. Whereas for the shift right operation, the serial input is applied to D input.

Block Diagram



Communication to I/O Devices

The CPU must have a way to pass information to and from an I/O device. There are three approaches available to communicate with the CPU and Device.

- Special Instruction I/O
- Memory-mapped I/O
- Direct memory access (DMA)

Special Instruction I/O

This uses CPU instructions that are specifically made for controlling I/O devices. These instructions typically allow data to be sent to an I/O device or read from an I/O device.

Memory-mapped I/O

When using memory-mapped I/O, the same address space is shared by memory and I/O devices. The device is connected directly to certain main memory locations so that I/O device can transfer block of data to/from memory without going through CPU.

While using memory mapped IO, OS allocates buffer in memory and informs I/O device to use that buffer to send data to the CPU. I/O device operates asynchronously with CPU, interrupts CPU when finished.

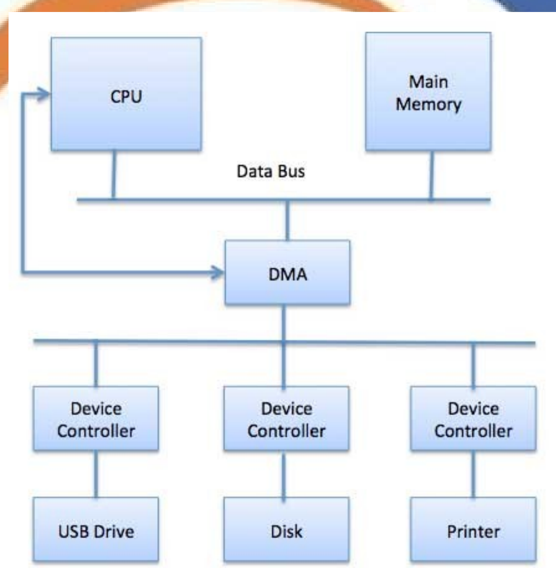
The advantage to this method is that every instruction which can access memory can be used to manipulate an I/O device. Memory mapped IO is used for most high-speed I/O devices like disks, communication interfaces.

Direct Memory Access (DMA)

Slow devices like keyboards will generate an interrupt to the main CPU after each byte is transferred. If a fast device such as a disk generated an interrupt for each byte, the operating system would spend most of its time handling these interrupts. So a typical computer uses direct memory access (DMA) hardware to reduce this overhead.

Direct Memory Access (DMA) means CPU grants I/O module authority to read from or write to memory without involvement. DMA module itself controls exchange of data between main memory and the I/O device. CPU is only involved at the beginning and end of the transfer and interrupted only after entire block has been transferred.

Direct Memory Access needs a special hardware called DMA controller (DMAC) that manages the data transfers and arbitrates access to the system bus. The controllers are programmed with source and destination pointers (where to read/write the data), counters to track the number of transferred bytes, and settings, which includes I/O and memory types, interrupts and states for the CPU cycles.



The operating system uses the DMA hardware as follows −

Step	Description
1	Device driver is instructed to transfer disk data to a buffer address X.
2	Device driver then instruct disk controller to transfer data to buffer.
3	Disk controller starts DMA transfer.

4	Disk controller sends each byte to DMA controller.
5	DMA controller transfers bytes to buffer, increases the memory address, decreases the counter C until C becomes zero.
6	When C becomes zero, DMA interrupts CPU to signal transfer completion.

Polling vs Interrupts I/O

A computer must have a way of detecting the arrival of any type of input. There are two ways that this can happen, known as polling and interrupts. Both of these techniques allow the processor to deal with events that can happen at any time and that are not related to the process it is currently running.

Polling I/O

Polling is the simplest way for an I/O device to communicate with the processor. The process of periodically checking status of the device to see if it is time for the next I/O operation, is called polling. The I/O device simply puts the information in a Status register, and the processor must come and get the information.

Most of the time, devices will not require attention and when one does it will have to wait until it is next interrogated by the polling program. This is an inefficient method and much of the processors time is wasted on unnecessary polls.

Compare this method to a teacher continually asking every student in a class, one after another, if they need help. Obviously the more efficient method would be for a student to inform the teacher whenever they require assistance.

Interrupts I/O

An alternative scheme for dealing with I/O is the interrupt-driven method. An interrupt is a signal to the microprocessor from a device that requires attention.