BEA-301 Mathematics-III

UNIT-I

Numerical Methods: Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT-II

Numerical Methods: Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.

UNIT-III

Numerical Methods: Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

UNIT-IV

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

UNIT-V

Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company,

2nd Edition, Reprint 2012.

2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,

Reprint, 2010.

6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book

8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed.,

Wiley, 1968. Statistics.

EIA- 302 Electromagnetic Theory

UNIT-I

Review of vector calculus: orthogonal coordinate systems, gradient, divergence and curl. Laplacian operator for scalar and vectors. Vector integral and differential identities and theorems. Phasor representation of harmonic variation of scalar and vectors Static electric fields, Columb's law, electric flux density and electric field intensity, permittivity, dielectric constant, field of distributed charges in free space, potential function, Laplace's and Poisson's equations, electric dipole, stored electric energy density.

UNIT-II

Solution of Laplace's equations in systems of dielectric and conducting boundaries, uniqueness theorem, two dimensional boundary condition problems, solution by symmetry, conformal transformation of functions, image theory etc. fields in parallel wire, parallel plane and coaxial systems. Static currents and magnetic fields- flow of charge in conductive media, lossy conductive medium, current density, specific conductivity, mobility, explanation of Ohm's law employing mobility. Magnetic effects of current flow, Biot-Savart's law in vector form magnetic field intensity, magnetic flux, and permeability, closed loop currents, Ampere's circuital law in integral and differential vector form, magnetic vector potential and related equations.

UNIT-III

Time varying fields – Faraday's law in integral and differential forms, displacement current concept, Maxwell's equations in differential and integral forms, wave equations in source free region electric and magnetic stored energy density, continuity equation, Poynting vector theorem. Time harmonic fields, r.m.s. phasor representation of field vectors, Maxwell's equations for TH field, average energy density, complex Poynting vector.

UNIT-IV

Circular and elliptic polarization, resolution in terms of linear polarized waves and vice- versa. Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, loss tangent, skin depth, transmission line analogy.

UNIT-V

Reflection and refraction of plane waves at dielectric media and conducting Surfaces, Brewster's angle, total internal reflection, resultant fields and power flow in both media. Frequency dispersive propagation, phase velocity and group velocity.

References:
1. Mathew N.O Sadiku: Elements of Electromagnetic, Oxford University Press.
2. William H. Hayt: Engineering Electromagnetic, TMH.
3. John D. Kraus: Electromagnetics, Mc. Graw Hill.
4. Jordan Balmian: Electromagnetic wave and Radiating System, PHI.
5. David K. Cheng: Electromagnetic Fields and Wave, Addison Wesley.
6. Ramo, Whinnerry and VanDuzzer " Fields and waves in communication electronics ", Wiley 1984
7. Harrington RF, "Electromagnetic fields" Mc Graw Hill

EIA- 303 Electrical Instrumentation

UNIT-I

Introduction to measurement: Definition, application and types of measurement System, Accuracy, Precision, sensitivity, Resolution, introduction to static and Dynamic Characteristics, Error and uncertainty analysis, Loading effect.

UNIT-II

Electrical measurement: Construction and operation of moving coil, moving iron, hot iron instrument-Ammeter & voltmeter, Theory and Operation of D'arsonval, Ballistic and vibration Galvanometer, instrument transformers. Extension of instrument ranges.

UNIT-III

R, L, C Measurement: Bridges: Measurement of resistance using Wheatstone bridge, Kelvin's double bridge, Loss of charge method, ohm meter, meggar Measurement of inductance and capacitance by A.C. bridges: Maxwell's bridge, Anderson bridge, Schering bridge, Hay's bridge, Wein's bridge, Shielding and grounding, Q meter.

UNIT-IV

Digital instruments: Advantages of digital instruments, Over analog instruments, D-A, A-D conversion, Digital voltmeter, Ramp type DVM, Integrating DVM, successive approximation DVM, frequency meter. Display devices: CRO-construction and working, deflection, triggering & synchronization, Time, Phase, Frequency measurement. Storage CRO, Sampling CRO, Digital Oscilloscope. Displays (LED, LCD and seven segment etc)

UNIT-V

Signal generator: Function generator, sweep frequency generator, Pulse and square wave generator, Wave Analysers, Harmonic Distortion Analyser, Spectrum Analyser, frequency counter.

References:

1.Modem Electronics Instrumentation, Albert D. Cooper, PHI.

2. Electrical and electronic Measurement by A.K.Sawhney

 3. Measurement system by Doebelin 4. Electronic Instrumentation – Kalsi – TMH List of

List of Experiments :-
Step 1: Circuit should be designed/ drafted on paper.
Step 2: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER).
Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.
Step 4: The bread board circuit should be fabricated on PCB prepared on PCB machine.
1.   Experiments to enhance knowledge pertaining to this subject.

EIA- 304 Electronic Devices

UNIT-I

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodicLattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon.

UNIT-II

Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.

UNIT-III

Generation and recombination of carriers Poisson and continuity equation P-N junction characteristics, I-Vcharacteristics, and small signal switching models; Avalanche breakdown,Zener diode, Schottky diode.

UNIT-IV

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model,MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.

UNIT-V

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography,etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text /Reference Books:
1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.

List of Experiments:

Step 1: Circuit should be designed / drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)

2. Characteristics of Transistors (BJT and FET)

3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc

EIA- 305 Network Analysis and Synthesis

UNIT-I

Node and Mesh Analysis, matrix approach of network containing voltage and current sources,and reactances, source transformation and duality. Network theorems: Superposition, reciprocity,Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem asapplied to AC. Circuits.

UNIT-II

Trigonometric and exponential Fourier series: Discrete spectra andsymmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs,power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT-III

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis,analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT-IV

Transient behavior, concept of complex frequency, Driving points and transfer functions polesand zeros of immittance function, their properties, sinusoidal response from pole-zero locations convolution theorem and Two four port network and interconnections.

UNIT-V

Behaviors of series andparallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Reference Books
1. Van, Valkenburg.; "Network analysis" ; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

List of Experiments:
1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

EIA- 306 Simulation Lab

PCB DESIGNING SOFTWARE Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis Design, Optimization and simulation of

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc). 2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.

3. Use of virtual instruments built in the software. Study of PCB layout software Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software or other available. Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

EIA-307 Self Study / GD Seminar

Objective of GD and seminar is to improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.

EIA-308 Internship-I

1. Internship on area in Electronics filed .

Note- In this internship student should complete 90 Hr Internship on Electronics filed