EX 501- Digital Communications

Unit – I Elements of Digital Communication Systems: Elements of digital communication systems: model of digital communication systems, digital representation of analog signal, certain issues in digital transmission, advantages of digital communication systems, bandwidth-s/n tradeoff, hartley shnnon law, sampling theorem.

Unit – II Pulse Code Modulation: PCM generation and reconstruction, quantization noise, non uniform quantization and commanding, DPCM, adaptive DPCM, DM and adaptive DM. noise in PCM and DM.

Digital Modulation Techniques: Introduction, ASK, AKS modulator, coherent ASK detector, non-coherent ASK detector, FSK, bandwidth and frequency spectrum of FSK. non coherent FSK detector, coherent FSK detector, FSK detection using PLL, BPSK, coherent PSK detection, QPSK, differential PSK.

Unit – III Baseband transmission and optimal Reception of digital signal: Pulse shaping for optimum transmissions, baseband signal receiver, probability of error, optimum receiver, optimal of coherent reception, signal space representation and probability of error, eye diagrams, cross talk.

Unit – IV Information Theory: Information and entropy, conditional entropy and redundancy, Shannon fano coding, mutual information, information loss due to noise, source coding – Huffman code, variable length coding, source coding to increase average information per bit lossy source coding.

Unit – V Linear Block Codes: Matrix description of linear block codes, error detection and error correction capabilities of linear block codes, cyclic codes, algebraic structure, encoding, syndrome calculation.

Convolution Codes: Encoding, decoding using state, tree and trellis diagrams, decoding using Viterbi algorithm, comparison of error rates in coded and encoded transmission.

References:

1. Principles of communication systems- Herbert Taub. Donald L Schiling, Goutam Sana, 3rd Edition, McGraw-Hill, 2008
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.
3. Digital Communications – John G. Proakis. Masoud Salehi – 5th Edition, McGraw-Hill, 2008.
4. Digital Communications – Simon Haykin, Jon Wiley, 2005.
5. Digital Communications – Ian A. Glover, Peter M. Grant, Edition, Pearson Edu., 2008.
6. Communication Systems – B.P. Lathi, Bs Publication, 2006.

EX 502- Electrical Machine-II

Unit I - **Basics of Synchronous Machine**: Construction & working principle, types of prime movers, excitation system, polyphase distributive winding, coil span and winding factors , integral and fractional slot windings; emf equation, harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and A.S.A method.

Unit II - **Synchronous Machine- I**: Salient pole machines, two reaction theory equivalent circuit model and phasor diagram, determination of Xd and Xq by slip test, power angle equation and characteristics, synchronizing of alternator with infinite busbar, parallel operation and load sharing, synchronizing current, synchronizing power and synchronizing torque coefficient, synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque.

Unit III - Synchronous machine-II: Synchronous motor operation, starting and stopping of synchronous motor, pull in & pull out torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, super synchronous and sub synchronous motors, hunting, damper winding, efficiency and losses.

UNIT IV- Short Circuit Ratio: SCR and its significance, short circuit oscillogram, determination of various transient, sub transient, steady reactances and time constants, expression of transient and sub transient reactances w.r.t self and mutual inductances of various winding, short circuit current, equivalent circuit.

Unit V- Special Electrical machines: PM brushless DC motor, switched reluctance motor, linear induction motor, stepper motor**,** their constructional features, principle of operation & applications.

References:

1. P.S. Bimbhra, Generalised Theory of Electrical Machines.
2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
3. Electrical Engineering by JB Gupta, SK Kataria & sons, New Delhi
4. Fitzgerald, C.Kingslay, S.D. Umans, Electric machinery ,5th Ed., McGraw Hills, 1992
5. Electrical Machines, Ashfaq Hussain ,2014

List of Experiments :(Extendable)

1. Study of torque step rate characteristic of a stepper motor.
2. Study of Characteristic of switched reluctance motor.
3. To determine regulation of alternator using mmf and zpf methods.
4. To synchronise alternator with infinite bus bar.
5. To plot V and inverted V curves for a synchronous motor.
6. To find Xd and Xq of salient pole synchronous machine by slip test.

EX 503 – Power Electronics

Unit-I Power Electronic Devices: Power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode, construction, principle , operation & characteristics of SCR, Two transistor analogy, turn on & off of SCR, commutation techniques (Class A,B,C,D,E, & F Commutation), UJT, ramp triggering, SCR rating & protection, snubber circuit, heating, cooling & mounting of SCR, series and parallel operation of SCR, String efficiency.

Unit-II Rectifier: Single phase half wave & full wave uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction), & RLE loads, average load voltage and load current, active and reactive power, effect of free wheeling diode and source inductance, comparison of mid point & bridge rectifier circuits.

Unit-III Inverter: Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction.

Unit-IV Chopper: Chopper operation, Step up & step down choppers, chopper configuration (A, B, C, D, & E), Steady state analysis, Current & voltage commutation of chopper circuits, Jones & Morgens chopper.

Unit-V AC voltage controllers: AC voltage controllers using SCRs & traics, single phase full wave controller with R and RL load, RMS load voltage, load current and input power factor, three phase AC voltage controller, Dual converter, Switched mode voltage regulator, buck, Boost, & Chuck regulators, Single phase & three phase cyclo convertor.

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson

1. Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.
6. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.

List of Experiments (Extendable):

1. To study V-I characteristics of SCR.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with R load (ii) L load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study single-phase ac voltage regulator with resistive and inductive loads.

6. To study single phase cyclo-converter.
7. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.
8. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.

EX 504 - Electronics Instrumentation

Unit I - Cathode Ray Oscilloscope: CRO, electrostatic focusing, electrostatic deflection, post deflection acceleration, screen for CRTs, graticule, vertical & horizontal deflection system, time base circuit, oscilloscope probes attenuators, application of CRO, lissajous patterns, dual trace, dual beam, sampling, storage (analog & digital) oscilloscopes.

Unit II - A.C. Bridges: Measurement, sources and detectors, measurement of inductance, capacitance & Q factor, Maxwell's bridge, Maxwell's inductance & capacitance bridge, Hays bridge, Anderson's bridge, Owen's bridge, De-sauty's bridge, Schering bridge, Heaviside Campbell's bridge, Weins bridge, Universal bridge, errors in bridge circuit, Wagner's earthing device, Q meter .

Unit III - Transducers: Classification, characteristic & choice of transducers, resistive, inductive and capacitive transducers, strain gauge, gauge factor, thermistor, thermo couples, LVDT, RVDT, piezo-electric transducers, magneto elastic and magnetostrictive, hall effect transducers, opto-electronic transducers.

Analog & Digital Data Acquisition Systems: Instrumentation systems used, interfacing transducers to electronic control & measuring systems, d/a multiplexing, a/d multiplexing, special encoders.

Unit IV - Signal Generators: Fixed & variable frequency AF oscillators, sine wave generators, AF sine and square wave generator, function generator, square & pulse generator, random noise generator, sweep generator, TV sweep generator, sweep- marker generator, video pattern generator vectroscope, beat frequency oscillator, frequency selective wave analyzer, heterodyne wave analyzer, harmonic distortion analyzer, spectrum analyzer, digital fourier analyzer.

Unit V - Digital Instruments: Advantages of digital instruments over analog instruments, resolution , sensitivity, digital voltmeter - ramp type, dual slope integration type, integrating type, successive approximation VM, digital multimeter, digital frequency meter, electronic counter, digital tachometer, digital ph meter, digital phase meter, digital capacitance meter, LED, LCD, nixies, electro luminescent, incandescent, liquid vapour display, dot-matrix display, analog recorders, X-Y recorders, RS 232C, IEEE 488, GPIB electric interface.

References:

1. Albert. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and measurement techniques, PHI.
2. Kalsi H.S., Electronic Instrumentation, TMH.
3. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
4. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering Bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R, L, C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of piezo-electric transducer and measurement of impact using piezo-electric transducer
9. Measurement of displacement using LVDT.
10. Measurement of speed of a motor using photoelectric transducer.
11. Study & measurement using ph meter.
12. Temperature measurement & control using thermo couple & using thermistor.

EX- 505 – Energy Conservation & Management

Unit-I General Energy Problem: Energy use patterns and scope for conservation, energy audit, energy monitoring, energy accounting analysis, and targeting, energy management, types of energy audit, qualities and function of energy managers, language of an energy manager, check list for top management, loss of energy in material flow, energy performance, maximizing system efficiency, input energy requirements, energy auditing instruments, material load energy balance diagram.

Unit- III Thermodynamics of Energy Conservation: Basic principle, irreversibility, second law, efficiency analysis of systems, primary energy sources, optimum use of prime-movers, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation, thermal energy audit in heating, ventilation and air conditioning, friction, lubrication, predictive and preventive maintenance.

Unit-III Load curve analysis: Load curve analysis & load management, DSM, energy storage for power systems (mechanical, thermal, electrical & magnetic), restructuring of electric tariff from energy conservation consideration, economic analysis depreciation method, time value of money, evaluation method of projects, replacement analysis, pay back period, energy economics, cost benefit risk analysis,

Unit-IV Energy Efficient System: Energy efficient electric drives, energy efficient house keeping energy efficient motors, energy flow networks, simulation & modeling, alternative option, matrix chart.

Unit-V Energy conservation: Energy conservation policy, energy conservation task before industry, energy conservation equipment's , co-generation, energy conservation process, energy conservation in transportation system especially in electric vehicle industry- sugar, textiles, cement , electrical energy conservation in building, heating and lighting, domestic gadgets .

References:

1. Energy Management – W.R. Murphy & G. Mckey Butler worths.
2. Energy Management Head Book- W.C. Turner, John Wiley.
3. Energy Management Principles- Craig B. Smith, Pergamon Press.
4. Energy Conservation- Paul O Callagan- Pergamon Press.
5. Design & Management of energy conservation. Callaghan.
6. Elect. Energy Utilization & Conservation. Dr. Tripathi S.C.

EX- 506 Matlab & simulation Lab.

Course Content: Introduction to matlab /scilab, study of matlab /scilab programming, simulation, modeling, design and development of programs, application of the software in the field of control systems and communication systems.

List of Experiment (Expandable)

1. Space model for classical transfer function using MATLAB.
2. Program for the Bode response of a type one transfer function.
3. Program for the Bode response of a type two transfer function
4. Program to determine the time response of a given transfer function for step input and also determine maximum overshoot and peak time.
5. Program to determine the time response of a given transfer function for impulse input, maximum overshoot and peak time.
6. Program for sketching root locus open loop transfer function
7. Program to add the time delay for a specified input.
8. Program for sketching Nyquist plot for open loop transfer function.

References:

1. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
2. Kuo: Automatic Control Systems, PHI Learning
3. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
4. Singh and Chaudhari: Matlab Programming, PHI Learning
5. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
6. http://www.scilab.in
7. http://www.matlab.in