SEMESTER: FIFTH
5EP01 CONTROL SYSTEM-I

SECTION-A

Unit I: Introduction to automatic control: open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functionis, block diagrams and signal flow graphs.

Effect of feedback on sensitivity to parameter variation and reduction of the noise.

Unit II: Control System Components: Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: Time response analysis: time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series.

Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B


Root Locus: construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V: Frequency response methods: frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response.


TEXT BOOKS:

5EP02 MICROPROCESSORS & MICROCONTROLLERS

SECTION-A

Unit I : 8085 : architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of 8085 (software and hardware interrupts). Data transfer schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisition system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc. Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).
Unit VI: **Introduction to microcontroller**: 8051 architecture, 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

**TEXT BOOKS**
1) Microprocessor Architecture, Programming, and Applications with the 8085, Romesh Gaonkar PHI Publication - 2006
2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003

**REFERENCE BOOKS**
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005

5EP03 **ELECTRICAL MACHINES II**

**SECTION A**
Unit I: Fundamentals of AC rotating machines. AC windings- integral slot, fractional slot and fractional pitch windings- distribution factor, pitch factor and winding factor-harmonic mmf of distributed windings, EMF equation.
Unit II: Synchronous Generators: constructional details, armature reaction-circuit models and phasor diagram of salient and non salient pole machines - determinations of parameters of the circuit models - methods of determining regulations and efficiency, transient and subtransient reactances. Unit III: A) Synchronous Motors: principle of operation - torque equation - circle diagrams - V-curves - hunting and damping starting applications.
B) Methods of synchronization - synchronous machine on infinite busbars - parallel operation of generators. Introduction to conducting and reporting the test on synchronous machine as per IS.

**SECTION B**
Unit IV: Three phase induction motor: rotating magnetic fields, principles of operation-constructional details - circuit models and phasor diagram, performance equations direct and indirect testing circle diagram.
Unit V: Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking- single phasing, cogging and crawling, schrage motor.
Unit VI: A) Single phase IM: different types - starting methods - characteristics and applications. B) AC commutator machines-series motors - characteristics and applications.
C) Small machines-principle of operation, construction characteristics and applications of Printed Circuit Motor (PCM), Syn, ind motor, reluctance motor and hysteresis. Introduction to conducting and reporting the test on single phase induction motor as per IS.

**TEXT BOOKS**
3. Performance and Design of Alternating Current Machines : M.C.Say,

5EP04 **SIGNALS AND SYSTEMS**

**SECTION A**
Unit II: Fourier series and Its Properties
Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III: Analysis of LTI Discrete-Time Systems
Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response

SECTION B

Unit IV: Sampling
Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals from its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V: The Z Transform
The Z Transform; The Region of Convergence for the Z-Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI: Discrete Fourier Transform and Fast Fourier Transform
Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended
1) PRINCIPLES OF LINEAR SYSTEMS AND SIGNALS, 2E (international version) – Lathi B. P. Oxford University Press
2) Signals & Systems, Smarajit Ghosh, PEARSON education, 2006
3) Signals & Systems, D Ganesh rao, Satish Tunga, PEARSON education 2010
4) PRINCIPLES OF SIGNAL PROCESSING & LINEAR SYSTEMS (international version) Lathi B P. Oxford University Press
6) Analog And Digital Signal Processing, Ambardar A, 2/3; Thomson Learning-2005
7) Signals and systems, Oppenheim and Schaffer Prentice Hall India Of India 2nd Edition 1997

5EP06 COMMUNICATION SKILLS
Unit I: Comprehension over an unseen passage. Comprehension – A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph,
sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictoral devices. Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Raman Sharma "Technical Communication", Oxford University Press..
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

5EP07 CONTROL SYSTEM-I LAB
Any TEN experiments based on contents of 5EL01 CONTROL SYSTEM-I

5EP08 MICROPROCESSORS & MICROCONTROLLERS LAB
Any TEN experiments based on contents of 5EL02 MICROPROCESSORS & MICROCONTROLLERS

5EP09 ELECTRICAL MACHINES II LAB
Any TEN experiments based on contents of 5EL03 ELECTRICAL MACHINES II

5EP10 COMMUNICATION SKILLS LAB
Objective: On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same.

Aim of the list is to inform about minimum expected outcomes.
1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language labouratory experiments.

http://www.teachingenglish.org.uk
SEMESTER : SIXTH
6EP01 ELECTRICAL POWER I

SECTION-A
Unit I : Transmission line parameters : calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on inductance and capacitance, interference with communication lines.
Unit II : Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal TI and equivalent T representations, Ferranti effect, corona phenomenon, effect of corona and power loss due to corona. Representation of power systems : per unit system and one-line reactance diagrams.
Unit III : Voltage control and power factor improvement : receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers, analytical and graphical methods, automatic voltage control.

SECTION-B
Unit IV : Load flow studies : load flow problem, classification of buses, network modeling, Y-bus and Z-bus matrices, load flow equation, Gs and NR methods, comparison of methods used.
Unit V : Mechanical design : materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Introduction to insulator testing, line supports for LV, HV and EHV, Sag calculation, stringing charts.
Unit VI : Underground cables : material used for conductor & insulation : different types of cables and their manufacture, parameters of underground cable, grading of cable losses, break down and rating, testing of cables.

Text Books :-
5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004

Reference Books :-

6EP02 OPTIMISATION TECHNIQUES

SECTION-A
Unit I : Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.
Unit II : Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.
Unit III: Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced and unbalanced transportation problems.

SECTION-B
Unit IV: Non linear programming - unimodal function, unrestricted search, Fibonacci search method and Folden section method, unconstrained optimization, direct search methods - pattern search methods, simplex method, descent method - steepest descent method, conjugate gradient and variable metric method.

Unit V: CPM and PERT introduction - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.

Unit VI: Dynamic programming: multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value problem, solution of linear programming. Continuous dynamic programming.

**BOOKS:**
1) S.S.Rao : Optimization - Theory & Application, Wiley Eastern Ltd.
3) Operation Research by Richard Bronson, G. Naddimuthu, TMH Schauuml; outlines, 2nd edition 2010

**REFERENCE BOOKS:**
4) J.C.Pant : Introduction to Optimization, Jain Brothers, New Delhi

**6EP03 POWER ELECTRONICS**

**SECTION-A**

Unit I: SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF
SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO, power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II: Series-parallel operation of SCRs, firing ckt.s for series and parallel operation, static & dynamic equalising ckt.s, equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.

Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

**SECTION-B**

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V: Basic principles of inverter, time ratio control and current limit control techniques, voltage commutated bridge ckt., Jones bridge, step-up bridge, step-down bridge and AC bridge.

Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

Unit VI: Speed control of DC series motors using bridge, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control, v/f control and slip power recovery scheme. Static ckt. braker, UPS, fan speed regulator, principle of soft start ckt.s. Zero Voltage Switch.

**TEXT BOOKS:**
3) Principles of Power Electronics, J.G.Kassakian,M.F.SchlechtG.C.Vergheese, PEARSON Education 2010

**Reference books:**
1) Dr.P.S.Bimbhra : Power Electronics, Khanna Publisher, New Delhi.

**6EP04 COMPUTER AIDED MACHINE DESIGN**

**SECTION-A**

Unit I : Introduction : transformers and three phase induction motors - types, specifications, constructional features, magnetic and insulating materials used; design approaches - analysis, synthesis and hybrid methods; design - variables, constraints and objectives; magnetization, loss and career’s coefficient curves - applications, representation using Piecewise Linearisation and Least Square Error methods.

Unit II : Transformer Design - Magnetic Circuit Specific electric and magnetic loadings selection, output equation, core and yoke cross sections, main dimensions design, core loss from design data.

Unit III: Transformer Design :
A) Electric circuit : Winding types and design, magnetizing current calculation, primary and secondary winding resistances and leakage reactances from design data; mechanical forces - types, causes and calculations.

B) Thermal circuit cooling methods, Tank wall dimensions design. Design of tank with radiators.

**SECTION-B**

Unit IV: Induction motor stator design : specific electric and magnetic loadings selection, output equation, main dimensions design, winding - types and design, slot numbers and dimensions design.

Unit V : Induction motor rotor design : Air gap length design, cage rotor winding design - slot numbers and shapes, bar and ring dimensions; slip ring rotor winding design - slot numbers and shapes, conductors per slot and its cross sections.

Unit VI : Induction motor parameters : core loss from design data, magneto motive force calculation - air gap, stator and rotor cores and teeth; no load current - magnetizing and core loss components, stator and rotor winding resistances and leakage reactances from design data, parameters effect on performance.

**BOOKS RECOMMENDED**

5. Indrijit Dasgupta, Design of Transformers, TMh 1st Edition 2002

**6EP05 UTILISATION OF ELECTRICAL ENERGY**

**SECTION-A**

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

**SECTION-B**

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.
b) Methods of heating and welding furnaces

**TEXT BOOKS:**

**REFERENCE BOOKS:**
3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.

**6EP07 POWER ELECTRONICS LAB**
Any TEN experiments based on contents of 6EP03 POWER ELECTRONICS

**6EP08 COMPUTER AIDED MACHINE DESIGN LAB**
Any TEN experiments based on contents of 6EP04 COMPUTER AIDED MACHINE DESIGN

**6EP09 UTILISATION OF ELECTRICAL ENERGY LAB**
Any TEN experiments based on contents of 6EP05 UTILISATION OF ELECTRICAL ENERGY