EE 601 POWER SYSTEMS – I

Module I

Conventional sources of electrical energy- thermal, hydroelectric, diesel and nuclear power plants-introduction to renewable energy sources- power plant economics – operating coasts- load factor- demand factor- diversity factor- plant factor. Types of tariffs, power factor improvement.

Module II

Overhead transmission systems- arrangement of conductors- sag and tension- transmission line supports and their location, economic span- choice of transmission voltage- line insulators- string efficiency- impulse ratio- arcing horns and rings- failure of insulation- corona- under ground cables- different types- capacitance of single core and three core cables- grading of cables.

Module III

Distribution systems- classification and arrangement of distribution systems- distribution substation layout and arrangement- economic loading of distribution transformers- design of feeders. Kelvin's Law- considerations in primary and secondary distribution system design- current distribution and voltage drop in single-phase and three-phase four-wire distribution systems- voltage drop calculation and design of distributors in ring system- improvement of existing distribution systems- LT capacitor installation- size and connection- Rising mains- Equipment earthling- Electric energy management. Power quality.

Module IV

Performance of transmission lines- calculation of transmission line inductance and capacitance- GMD and GMR- bundled conductors- transposition- ABCD constants- effect of capacitance- nominal T and π methods of calculations- power flow through a transmission line. Methods of voltage control.

Reference:

Soni, Gupta, Bhatnagar - *A course in Electric Power*, Dhanapat Rai & Sons New Delhi, 1996.

A.T Star, - *Generation, Transmission & Utilization of Electric Power*, Sir. Issac Pitman and Sons, 1961.

Turan, Goren - *Electric Power Transmission System Engineering*, John Wiley,1988.

S.L Uppal - *Electric Power*, Khanna Publishers, 1992.

A.S Pabla - *Electric Power Distribution System*, Tata McGraw Hill, 1992.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EE 602 DIGITAL SIGNAL PROCESSING

Module 1

Introduction to signals & systems- Discrete time signals and systems- Properties of discrete systems-linearity,timeinvariance-causality-stability.convolution.difference equation representation of discrete systems -The Z transform-properties of Z transform- the inverse z transform-System Transfer function.

Module 2

Frequency domain representation of discrete time signals. Discrete Fourier series(DFS)-properties Discrete Time Fourier Transform (DTFT) properties, Discrete Fourier Transform(DFT) properties& Fast Fourier Transform(FFT) Decimation in Time & Decimation in Frequency algorithms.

Module 3

FIR digital Filters: Transfer function. Generalized Difference equation representation. Concept of windowing. Non Recursive realization structures-direct (Tapped delay line structure) –cascade realization- Liner phase realization.

IIR Digital Filters : - Transfer function. Difference equation representation. Recursive Realizations Direct form I , Direct form II –Cascade Realization-Parallel realization – Comparison of IIR & FIR filters in terms of computational complexity, memory requirement, hardware complexity, stability .

Module 4

Finite word length effects in digital filters- fixed point arithmetic -Floating point arithmetic- Block floating point arithmetic - Truncation-Rounding - Quantization error in analog to digital conversion-Limit cycles. General DSP architecture- features _ On chip subsystems- memory organization-Addressing modes- Instruction types - TMS320C54X fixed point processor- TMS320C4X floating point processor

Applications of DSP

References:

Cristi, Modern Digital Signal Processing, Ed. 1.
Ashok Ambardar, Analog and Digital Signal Processing, Edition 2.
Avatar Singh, Digital Signal Processing Implementations, Edition 1
John G Proakis & Dimitris G Manolakis : "Digital Signal Processing", PHI, New Delhi
Oppenheim & Ronald W Schafer : "Digital Signal Processing", Prentice Hall India
Sanjit K. Mithra, : " Digital Signal Processing", Tata Mc- Graw Hill

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 603 CONTROL SYSTEMS I

Module I

Frequency domain analysis, sinusoidal frequency response. Polar plots and logarithmic plots – Bode plots – Nyquist plots – absolute stability and relative stability from Bode and Nyquist plots.

Module II

Basic theory and properties of Root loci produce for construction of root loci, complete RL diagram.

Control system components: synchros, d.c servomotor, a.c servomotor, stepper motor, tacho generator.

Module III

Design of control systems. Cascade and feedback design. Modes of control .P, I, D and combinations of P, I and D and effects on system performance. On- off control lead, lag, lead-lag design using Bode plots and root locus. PID controller tuning in process control.

Module IV

System design using state feed back. Controllability, Observability.State feed back control. Placement of poles at desired location using state feedback – observers. Design of full order and reduced order observers.

Reference:

Ogata.K- "*Modern Control Engineering*", Law Price Edition.
M.Gopal,"C*ontrol Systems*", Tata Mc Graw Hill.
A.Nagoorkani "*Control Systems*", RBA Publication

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 604 ELECTRICAL DRAWING

Module I

D.C Armature windings- Simplex lap and wave windings.
Sectional front and side elevation of the armature with commutator.
Sectional front and side elevation of the yoke and pole assembly with field winding.
Sectional front and side elevation of an assembled dc machine.

Module II

Transformers

Sectional plan and elevation of core type and shell type single-phase transformer.
Sectional plan and elevation of a three-phase transformer.

Induction Motors

Sectional front and side elevation of slip ring and squirrel cage induction motor.

Alternators

Sectional front and side elevation of salient pole and turbo alternators.

Module III

Three-phase AC windings
Single layer windings- Mush windings and concentric windings.
Double layer lap windings- Full pitched, short pitched and fractional slot windings.
Double layer lap windings.

Module IV

Single line layout of substations.
Single line layout of generating stations.
Single circuit and double circuit transmission towers.

Reference:

Narang K.L - *A text book of Electrical Engineering Drawing* ,Trch India Publication.

S.K Battacharya - *Electrical Engineering Drawing*.

A.K Sawhney - *Electrical Machine Design*, Dhanapath Rai, New Delhi.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 605 MODERN COMMUNICATION ENGINEERING

Module 1

Microwave Communication : Basic principles of microwave links- Microwave Relay Systems – Choice of frequency – line of sight and over the horizon systems – modulation methods – block schematics of terminal transmitters and receivers – microwave repeaters – microwave repeaters – microwave repeaters – microwave antennas – propagation mechanisms – propagation characteristics – path loss models – shadowing models – small scale fading and multipath fading – basic principles of design of microwave link

Module II

Satellite Communication – Orbit of communication satellite – Satellite Constellation – Orbital parameters – Orbital perturbations – Geostationary orbits – Low Earth and Medium Orbits – Look Angles – Frequency selection RF Links – Propagation characteristics – Modulation methods- coding – multiple access – space craft – antennas – transponders – intersatellite link – link power budget – earth station interference – Satellite systems – Geostationary systems – Distress and Safety systems – Navigation systems – direct sound broadcast systems – Direct Television broadcast systems

Module III

Wireless communication systems: Cellular concepts – Cell Splitting and Frequency Reuse - Propagation Mechanisms – Modulation techniques for wireless communication – Analog, Digital and Spread Spectrum modulation – Equalisation, Diversity and Channel coding Diversity Techniques – Multiple access techniques for Wireless Commuications – FDMA,TDMA and CDMA – Wireless systems and standards – AMPS – Global System for Mobile(GSM) – CDMA – General Packet Radio Service – DECT System .

Fiber optic communication: light wave communication systems- Fiber optic cable - optical transmitter and receiver.

Module 1V

Radiation and Propagation of Waves: - (analysis not required) - Electro magnetic Radiation- Waves in free space- polarization - reception- effects of Environment- Propagation of waves:- Ground waves- Sky-wave propagation - space waves- antennas- Basic consideration - wire radiator in space - common terms and definitions- Effects of ground on Antennas- Directional High frequency Antennas - UHF Micro wave antennas - Wide band and special purpose antennas.

References:

1) Electronic Communications : Dennis Roddy and John Coolen, Prentice Hall, India.
2) Electronic Communication Systems : Kennedy & Davis - Fourth Edition-TMH
3) Communication Electronics : Frenzel, McGraw Hill, International Editions.
   For Modules IV & V
4) Communication Electronics : Frenzel MGH

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B

EE 606 ELECTRICAL MACHINES III

Module I

Three phase induction motor - constructional details - slip ring and squirrel cage types- Theory of the induction machine with constant mutual flux - slip phasor diagram - mechanical power and developed torque - Torque slip curves - variation and starting torque with rotor resistance- pull out torque - losses and efficiency - approximate and exact equivalent circuits - circle diagram - No load and blocked rotor tests - performance calculations from the equivalent circuit.

Module II

Starting - starting squirrel cage motors- direct on-line starting auto transformer and star - delta starter - starting current and torque - starting of slip ring motors - design of rotor rheostat.

Effects of harmonics - Harmonic induction and harmonic synchronous torques - cogging, crawling and noise production - methods of elimination - special rotor construction - Deep bar, composite bar and Boucherot rotor constructions - equivalent circuits and torque curves of double cage motors.

Module III

Methods of speed control - pole changing methods - rotor rheostatic control - change of supply frequency - use of SCR for speed control - principle of speed regulation and improvement of power factor by rotor injected emf.

Induction generator Theory - phasor diagram - circle diagram - equivalent circuit - applications.

Synchronous induction motor- construction - rotor winding connections - circle diagram - pulling into step.

Module IV

Single phase induction motor - revolving field theory equivalent circuit - torque slip curve- starting methods - split phase, capacitor start, capacitor run motors shaded pole motor - repulsion start and repulsion induction motor.

Commutator motors - General, principles and theory - commutator as a frequency converter - emf induced in a commutator winding - single phase series motor - theory - phasor and circle diagram - compensating and interpole windings - universal motor - principle of repulsion motor - torque production - phasor diagram - compensated type of motors repulsion start induction motor - applications.

Poly phase commutator motors - Three phase series and shunt type - schrage motor - characteristics and applications .

References:

1) Performance & Design of AC Machines : Say MG
2) Theory of AC Machinery : Langsdorff AC
3) AC Commutator Motors : Openshaw Taylor
4) Alternating Current Machines : Puchstein & Lloyd
5) Electrical Machines Part I & II : Kostenko & Pietrovsky

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Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 607 MICROPROCESSOR LAB

Part A (Compulsory)

Study of a typical microprocessor trainer kit and its operation

Simple programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes – monitor routines.

Interfacing and programming of 8255 (eg: traffic light control , Burglar alarm, stop watch)

Interfacing and programming of 8253/8254

Interfacing and programming of 8279.

Part B

A/D and D/A converter interface

Stepper motor interface.

Display interface.

Programming of different types of EPROM 2716, 2732, etc…(at least two topics from Part B has to be covered.)

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 608 MINI PROJECT

Each batch comprising of 3 to5 students shall design, develop and realize an electronic product. Basic elements of product design must be considered. Fully software/simulation projects are not allowed. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation including the Bill of Materials and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

i) Attendance and Regularity	10
ii) Work knowledge and Involvement	30
iii) End-Semester presentation & Oral examination	20
iv) Level of completion and demonstration of functionality/specifications	25
v) Project Report	15
Total	100 marks

***Note**: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & co-ordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide*