

B.TECH ELECTRICAL ENGINEERING SYLLABUS V SEMESTER

GENERATION

Sub. Code: E-301

UNIT-I

General discussion on various types of conventional & non-conventional power generation, power sector reforms, ecological aspects of Power Generation

Hydro-Electric Stations-Choice of site, arrangement of hydroelectric installations, Hydrology, Mass curve, flow duration curve, water storage, classification of hydro electric plants, pumped storage plants, operating cost of hydroelectric station, tidal power generation, mini-micro hydro power stations.

UNIT-II

Thermal Power Stations : Choice of coal fired station site, arrangement of plant and principal auxiliaries, coal handling plant, Ash handling plant, heat recovery equipments, main electrical equipments, instrumentation, speed governor. Operating cost. Diesel and Gas Power plants.

UNIT-III

Nuclear Power Stations-Nuclear Physics, Atomic energy fuels, moderator materials, fissile and fertile materials. Fission & Fusion reactions, Choice of site, types of reactors, principal parts of nuclear power plant, operation and control of reactors. Comparison of various Power Plants.

UNIT-IV

Economic Aspects of Power Plant Operation-Fixed charges, interest and depreciation charges, methods of depreciation, straight line and sinking fund methods, different tariffs, effect of load factor, demand and diversity factors, power factor improvement by static and synchronous capacitors, power factor improvement, Active and reactive power control.

UNIT-V

Economic Scheduling of Power Stations-Economic operation of power systems, criteria for loading of power plants with and without transmission loss. Iterative methods to solve coordination equations, Load dispatching in power system cogeneration, Base & peak load operation, Hydro thermal coordination, Methods for computing the generation scheduling in combined hydro thermal system.

Reference Books:

1. Generation of Electrical Energy –B.R. Gupta
2. Non-conventional Energy Sources –G.D. Rai
3. Elements of power station design – M.V.Deshpande
4. Economic Load Dispatching - L. R. Kirchmare

ELECTRICAL MACHINE DESIGN

Subject Code: E-302

UNIT-I

General concepts & considerations of electrical machine design, factors affecting design and limitations, typical problems giving insight of machine design, nameplate specifications of electrical machines.

Laws of magnetic circuit, magnetization curves, Calculation of magnetic circuit for a D.C. Machine (air gap irregularities, M.M.F. of tooth section etc.).

Heat generation in electrical machines, modes of heat dissipation, Equations for temperature rise in electrical machines under steady state conditions. Heating and cooling time constants, ratings of machine, significance of rating of the design aspects, types of enclosures and their effect on design. Insulation classes & materials.

UNIT-II

Features regarding construction of transformer, choice of flux densities for yoke and core, current density, window space factor etc., determination of the main dimensions of the magnetic frame, design of low and high voltage windings, insulation details, calculation of resistance and leakage reactance. Performance of transformer from equivalent circuit, design of cooling system.

UNIT-III

Output equation, Calculation of main dimensions, design of armature and field system, effect of commutation, design of commutator, brush and inter-pole, losses and efficiency.

UNIT-IV

Main dimensions of the stator, Design of stator winding, Stator core, length of airgap, squirrel cage rotor, wound rotor. Performance calculations relating to design.

UNIT-V

Main dimensions of the stator, short circuit ratio, length of airgap, Design of stator winding, stator core, field system for salient pole alternator.

Reference Books:

1. Performance & Design of Electrical Machines : By V.N.Mittle & A.Mittal
2. Design of Electrical Machines : By A.K.Sawhney

POWER ELECTRONICS

Subject code: E-303

UNIT I

Basic concepts of construction, ratings of SCR, diac, triac, Static V-I characteristics, gate characteristics, ratings, protection of SCR, turn on and turn off methods, series and parallel operation of SCRs, switching devices like power transistors, MOSFET, GTO, IGBT etc.

UNIT II

Converter circuits: Single phase half wave, full wave, half controlled and fully controlled with resistive and inductive loads, use of feedback diode, three phase half wave & full wave converters, Effect of source inductance.

UNIT III

Principle of operation of chopper, types of choppers (single, two and four quadrant choppers), various commutation methods, voltage commutated chopper and current commutated choppers, Principle of cycloconverter operation, single phase to single phase cycloconverter circuit.

UNIT IV

Voltage & current source inverters, single phase centre tapped and bridge inverter with resistive load and inductive load. Use of feed back diode, three phase bridge inverters. Basics of PWM inverters.

UNIT V

Basic concepts of control circuit, synchronization circuit, isolation circuit. Various triggering circuits with & without unipolar & bipolar junction transistors for converters., choppers, and inverters.

Microprocessor/Microcomputer based control circuit.

Reference Books:

1. Power Electronics - C.Y.Lander
2. Power Controller - G.K.Dubey, Doradla, Joshi & Sinha
3. Power Electronics - M.H. Rashid
4. Power Electronics – P.S.Bhimbra

ELECTRONICS-II

Subject code: E-304

UNIT I

The differential amplifier, two input characteristics, AC analysis of a differential amplifier output offset voltage, common mode gain, current mirror, different characteristics, definition of terms of operational Amplifier and its applications-opamp as zero crossing detector, inverter, summer, integrator, differentiator, comparator, instrument amplifier, current to voltage and voltage to current converter.

UNIT II

Feed back concept, general characteristics of negative feed back amplifiers, input resistance, output resistance, Effect of feedback on amplifier bandwidth. Properties of feed back amplifier, topologies voltage series current series, voltage shunt and current shunt, Wien bridge oscillator RC phase shift, Hartley and Colpitt oscillator, 555 timer.

UNIT III

Large signal amplifiers class A, class B and basic idea of push pull action, distortion, the current mirror, Power relations, darlington and complementary pairs.

UNIT IV

Boolean algebra, theorems, minterms & maxterms, truth tables, Karnaugh mappings, sum of products & product of sums, logic gates, AND, OR, NAND, NOR & Exclusive OR. Half Adder, Full Adder, Multiplexer, Demultiplexer.

UNIT V

Multivibrators – Astable, Bistable and Mono stable multivibrator.
Flip flops, SR, JK, D Master slave, Application of flip-flop as counters, Registers, Sequence generators.

Reference Books:

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| 1. Electronic Devices & Circuits | - Millman & Halkies |
| 2. Electronics Principles | - A. P. Malvino |
| 3. Electronic Circuit Discrete and Integrated | - Donald L. Schilling and Charles Belove |
| 4. OPAMP & Linear Integrated Circuits | - Ramakant A. Gayakwad |
| 5. Digital Electronics | - William H. Gothmann |

ELECTROMECHANICAL ENERGY CONVERSION-III

Subject Code : E-305

UNIT I

Basis for development of generalized approach for analysis of electrical machines, Kron's primitive machines, concepts of rotational & transformer voltages, concept of pseudo stationary coils, voltage and flux linkages, equation of electrical machine based on coupled circuits approach, expressions for self and mutual inductance of various windings with respect to rotor position, Park's & inverse Park's transformations and their physical significance, expressions for flux linkages in terms of park's variables, transformed impedance matrix.

UNIT II

Formation and development of steady state equations based on a generalized approach for DC machine, Steady state behavior of DC machine, interconnection of machines, generalized model for different types of DC machines, transfer function of DC machines.

UNIT III

Basic synchronous machine parameters and generalized model of 3-phase synchronous machine (with & without damping machine), balanced steady state analysis and power angle characteristics, transient analysis, sudden reactive loading & unloading, sudden 3-phase short circuit of synchronous machine, reactances & time constants from Oscillogram.

UNIT IV

Development of generalized model for 3-phase induction machine, performance equation & steady state analysis, analysis of equivalent circuit, transient analysis by using generalized theory, effect of voltage & frequency variations on the induction motor performance, operation of I.M. on unbalanced supply voltage.

UNIT V

Constructional features, working principle and analysis of Single Phase Series motor, Stepper motor, Linear Induction Motor, Hysteresis motor, Universal Motor and Reluctance motor. AC & DC servo motors, brushless DC motor, Scherage motor, repulsion motor.

Reference Books:

1. Generalised Theory of Electrical Machines -P.S.Bhimbra
2. Electrical Machines - P.S.Bhimbra
3. Electrical Machines - P.S.Nagrath and D.P.Kothari
4. Electrical Machines - Fitzgerald Kingsley