PTEX-501- Electrical Engg. Materials

Unit I

Conducting Material: Classification and main properties, High resistivity alloy: Constant Manganin, Nichrome,etc. Electrochemical properties of copper, Aluminum, steel ,tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercury, Nickel, Titanium, Carbon, Lead, Bitmetals, thermocouple materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

Unit II

Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, extrinsic and scattering , P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect.

Unit III

Magnetic Materials: Introduction to magnetic materials, B.H curve , soft and hard Magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresia loop, Magnet rest square loop core materials, Iron alloys.

Unit IV

Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permitivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

Unit V

Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating

materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

TEXT BOOK:

1. L. Solymar, D. Walsh & R. R.A. Syms ‘Electrical Properties of Materials’, Oxford university press.
2. James F. Shackelford, Madanapalli K. Muralidhara ‘Introduction to Materials Science for Engineers’, Pearson
3. V. Rajendran ‘ Materials Science’ McGraw Hill education Pvt. Limited.
4. Ian P. Jones ‘ Materials Science for Electrical and Electronics Engineers’ Oxford university press.
5. Asleland, Fulay, Wright, Balani ‘The Science and Engineering of Materials’, Cengage learning.
6. K. M. Gupta and Nishu Gupta ‘Advanced Electrical and Electronics Materials’ Willey.
7. M. S. Naidu, “Gas Insulated Substations”, IK International Publishing House.

PTEX-502- Electronic Devices

Unit-I

Semiconductor intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, Hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of Si and Ge diode, transition and diffusion capacitance, power dissipation.

Unit-II

Diode Family and Applications: Diodes Family: Characteristics and application of p-n junction diode, Zener diode, avalanche diode, Varactor diode, Schottky diode, Tunnel Diode, PIN diode, LED, photodiodes. **Applications:** diode as rectifier, clipper and clamper, The diode as a circuit element, The Load line concept, The Pieceswise linear diode model, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diodes circuits.

Unit-III

Bipolar junction transistor - Construction, basic operation, current components and equations, CB, CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region, Ebers-Moll model, power dissipation in transistor, Photo transistor, Uni-junction Transistor (UJT) : Principle of operation & characteristics.

Unit-IV

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor.

Transistor at low frequency: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier. **Transistor at high frequency**, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain.

Unit-V

FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

TEXT BOOK:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education
2. Millman and Halkias: Integrated electronics, TMH
3. Graham Bell: Electronic Devices and Circuits, PHI
4. Sendra and Smith: Microelectronics, Oxford Press.
5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiments

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 Transistors as amplifiers.
4. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc).

PTEX- 503 – Power Electronics Devices & Circuits

Unit I

Advantages and application of power electronic devices, characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode MCTs. Principle of operation of SCR, Two transistor analogy, construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, commutation Techniques (Class A,B,C,D,E, & F) firing of SCR, Use of pulse transformer and opto-isolator in firing, Resistance firing ckt, Resistance capacitance firing circuit, UJT firing circuit, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR, series & parallel operation of SCR, String efficiency.

Unit II

Operation and analysis of single phase (Half wave & Full Wave) and three phase uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current. Effect of freewheeling diode and source inductance on performance of these rectifier circuits. Comparison of midpoint & Bridge rectifier circuits.

Unit III

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 techniques.

Unit IV

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

Unit V

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buck & Boost, Cuk regulators.

LIST OF EXPERIMENTS

1. VI characteristics of SCR
2. VI characteristics of DIAC
3. VI characteristics of BJT
4. Characteristics of TRIAC
5. VI characteristics of MOSFET
6. Transfer characteristics of MOSFET
7. Output characteristics of IGBT
8. Transfer characteristics of IGBT
9. Single phase SCR half controlled converter with R load
10. 1φ SCR fully controlled converter with r-load
11. Study of 3φ SCR half controlled converter
12. Study of 3φ SCR fully controlled converter
13. Study of classes of commutation a,b,c,d,e,f.

TEXT BOOK:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor & 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 Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7 Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.
8 Randall Shaffer, Fundaments of Power Electronics With MATLAB Cengage Leaening 2008.

PTEX-504-Power Plant Engineering

UNIT I- COAL BASED THERMAL POWER PLANTS : Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II- DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS: Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III- NUCLEAR POWER PLANTS: Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada DeuteriumUranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV- POWER FROM RENEWABLE ENERGY: Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V- ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS: Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants

TEXT BOOK:

1. P.K. Nag, Power Plant Engineering, Tata McGraw – Hill Publishing Company Ltd., Third Edition, 2008
2. M.M. El-Wakil, Power Plant Technology, Tata McGraw – Hill Publishing Company Ltd., 2010.
3. Black & Veatch, Springer, Power Plant Engineering, 1996.
4. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, Standard Handbook of Power Plant Engineering, Second Edition, McGraw – Hill, 1998.
5. Godfrey Boyle, Renewable energy, Open University, Oxford University Press in association with the Open University, 2004. 18 PTEE6401 ELECTRICA

PTEX 505 – Electrical Engg. Simulation Lab

LIST OF EXPERIMENT

1. To generate the pulse with the help of comparator.
2. To generate the pulse with the help of PWM techniques
3. To generate the pulse with the help of sine pulse width modulation
4. To find the time response for series RL, RC,RLC circuit.
5. Write a program to calculate the efficiency of the transformer at various load conditions and plot the graph between efficiency and load for given data.
6. Write a program to determine the equivalent circuit parameter for given problem.
7. Determine the output waveform for the clipper and clamper circuit
8. To observe the output waveform for the MOSFET
9. To observe the waveform of single phase full wave rectifier circuit with R load
10. To observe the waveform of single phase half wave thyristor circuit with R load
11. To observe the waveform of single phase full wave thyristor circuit with RL & RLE load
12. To observe the waveform of single phase semi convertor circuit with RL & RLE load
13. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode
14. To observe the waveform for class-B COMMUTATION
15. To observe the waveform of single phase half wave AC Voltage controller
16. To observe the load current ,voltage and speed waveform of Asynchronous Machine

TEXT BOOK:

1. Shailandra Jain, Modeling and simulation using MATLAB/SIMULINK ,willey
2. I.J.Nagrath,D.P. Kothari, Electrical machine,TMH
3. P.C. Sen ,Power Electronics, TMH