BACHELOR OF TECHNOLOGY
(Electrical Engineering)

Third Semester Examination

Code No.	Paper	L	T/P	Credit
THEORY PAPERS				
ETEE 201	Applied Mathematics – III	3	1	4
ETEE 203	Circuits & Systems	3	1	4
ETEE 205	Solid State Devices & Circuits	3	1	4
ETEE 207	Electrical Engineering Materials	3	0	3
ETEE 209	Electro Mechanical Energy Conversion – I	3	1	4
ETEE 211	Thermo dynamics	3	1	4
PRACTICAL / VIVA VOCE				
ETEE 251	Circuits & Systems Lab	0	2	1
ETEE 253	Electro Mechanical Energy Conversion Lab	0	2	1
ETEE 257	Solid State Devices & Circuits Lab	0	2	1
	Total	**18**	**11**	**26**

w.e.f. 2004-2005

BACHELOR OF TECHNOLOGY
(Electrical Engineering)

Fourth Semester Examination

Code No.	Paper	L	T/P	Credit
THEORY PAPERS				
ETEE 202	Electro Mechanical Energy Conversion – II	3	1	4
ETEE 204	Analog Electronics	3	1	4
ETEE 206	Power System	3	1	4
ETEE 208	Control Engineering	3	1	4
ETEE 210	Electromagnetic Field Theory	3	1	4
ETEE 212	Power Station Practice	3	1	4
PRACTICAL / VIVA VOCE				
ETEE 252	Electro Mechanical Energy Conversion Lab	0	2	1
ETEE 254	Analog Electronics Lab	0	2	1
ETEE 256	Power System Lab	0	2	1
ETEE 258	Control Engineering Lab	0	2	1
	Total	**18**	**14**	**28**

Code No.: ETEE 201 **L T**
Paper: Applied Mathematics – III **3 1**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Laplace Transformation: Laplace Transformation, Inverse Laplace transformation Convolution Theorem, application to linear differential equations with constant coefficients. Unit step function, impulse function, periodic function.

Unit II

Fourier series: Fourier series, Euler's formula, even and odd functions having arbitrary periods, half range expansion, Harmonic analysis. Fourier Transforms: Fourier transform, sine and cosine transforms, Application to differential equations.

Unit III

Special Functions: Beta and Gamma functions, Bessels functions of first kind, Recurrence relations, modified Bessel functions of first kind, Legendre Polynomial, Rodrigue's formula, orthogonal expansion of functions.

Unit IV

Partial Differential Equation: formation of first and second order linear equations, Laplace, wave and heat conduction equations, initial and boundary value problems.

Books:-

1. Advanced Engineering Mathematics: Kreyszig E: John Willey & sons
2. Advanced Engineering Mathematics: V. P. Jaggi and Mathur: Khanna Publication

Code No.: ETEE 203 **L T**
Paper: Circuits & Systems **3 1**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Signal: The unit step, unit impulse, unit ramp, sinusoidal and exponential functions, Periodic waveforms. Classification of signals and system modeling in terms of differential and difference equation for linear time invariant (I.TI) system.

Unit II

Laplace Transform: Applications of Laplace Transform to system Analysis. Waveform synthesis and Laplace Transform of complex waveform. Concept of Transformed impedance. Graph Theory and its applications.

Unit III

Network Theorems: Review of the Thevnin, Norton theorem in a.c. circuits, Reciprocity, Millman Theorem, Maximum Power Transfer Theorem, Tellegen's theorem. Network function, two port parameters, Interconnection of 2-port network.

Unit IV

Elements of Network Synthesis: Two elements kind one port network, Elementary two port network.

Books:-

1. Signals and Systems: A. V. Oppenheim, A. S. Willshy and S. H. Nawab: Prentice Hall
2. Engineering Network Analysis & Filter Design: Gopal G. Bhise, P. R. Chadha, D. C. Kulshre Sh: Umesh Publications

Reference:

1. Network Analysis – V. Valkenburg (Prentice – Hall India)
2. Engineering Circuits Analysis – William H. Hayt, JR. Jack E. Kemmerly (Tata McGraw Hill)
3. Network Syntheses: Van Valkenburg (Prentice – Hall India)
4. Circuit Theory (Analysis and Synthesis): A. Chakrabarti: Dhanpat Rai & Co.

Code No.: ETEE 205 **L T**
Paper: Solid State Devices & Circuits **3 1**

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Semiconductor Diodes and Rectifiers:

Introduction, general characteristics, energy levels, extrinsic materials n & p type, ideal diode, basic construction and characteristics, DC & AC resistance, equivalent circuits, drift & diffusion currents, transition & diffusion capacitance reverse recovery times, temperature effects, diode specifications, different types of diodes (Zener, Varactor, Schouky, Power, Tunnel, Photodiode & LED), Half wave & full wave rectifiers. Switched Mode Power Supply.

Unit II

Bipolar junction transistor:

Introduction, Transistor, construction, transistor operations, BIP characteristics, load line, operating point, leakage currents, saturation and cut off mose of operations, Eber-Moll's model.

Bias Stabilization:

Need for stabilization, fixed bias, emitter biad, self bias, bias stability with respect to variation in l_{co} V_{BE} & β, Stabilization factors, thermal stability.

Unit III

Small signal amplifiers:

CB, CE, CC configurations, hybrid model for transistor at low frequencies, RC coupled amplifiers, mid band model, gain & impedance, comparisons of different configurations, Darlington pair, Hybrid π-model at high frequencies, Cascaded amplifiers

Multistage Amplifiers:

Cascaded amplifiers, Calculation of gain Impedance and bandwidth, Design of multistage amplifiers.

Unit IV

Feedback Amplifiers:

Feedback concept, Classification of Feedback amplifiers, Properties of negative, Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers

Field Effect Transistor:

Introduction, Classification, FET characteristics, Operating point, Biasing, enhancement & Depletion type MOSFETS.

Books:

1. "Integrated Electronics: Analog & Digital Circuits & Systems", Jacob Millman, Christos C. Halkias, TMH.
2. "Semiconductor Devices & Circuits", B. P. Singh, Dhanpat Rai & Co.

Code No.: ETEE 207 **L T**
Paper: Electrical Engineering Materials 3 1

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Atomic bonding, crystallinity, Miller Indices, X-ray crystallorgraphy, structural imperfections, crystal growth.

Free electron theory of metals, factors affecting electric conductivity of metals, thermal conductivity of metals, heat developed in current Carrying conductors, thermoelectric effect, super conductivity.

Unit II

Polarization mechanism and dielectric constant, behavior of polarization under impulse and frequency switching, dielectric loss, spontaneous polarization, piezoelectric effect. Origin of permanent magnetic dipoles in materials, classifications, diamagnetism, paramagnetism, ferromagnetism, Magnetic Anisotropy magnetostriction.

Unit III

Energy band theory, classification of materials using energy band theory, Hall effect, drift and diffusion currents, continuity equation, P-N diode, volt-amp equation and its temperature dependence. Properties and applications of electrical conducting, semiconducting, insulating and magnetic materials.

Unit IV

Special purpose materials, Nickel iron alloys, high frequency materials, permanent magnet materials, Feebly by magnetic materials, Ageing of a permanent magnet, Effect of impurities, Losses in Magnetic materials

Books:-

1. A. J. Dekker, 'Electrical Engineering Materials', Prentice hall of India, India
2. C. S. Indulkar & S. Thiruvengadam, 'An introduction to Electrical Engineering Materials', S. Chand & Co., India
3. R. K. Rajput, 'Electrical Engineering Materials', Laxmi Publications, India
4. Ian P. Hones, 'Material Science for Electrical & Electronics Engineers', Oxford University Press

Code No.: ETEE 209 **L T**

Paper: Electro Mechanical Energy Conversion – I 3 1

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Principles of EMEC: Introduction, Energy in Electro-Magnetic System, Flow of Energy in Electro-Mechanical Devices, Energy in Magnetic field and co-energy, Dynamics of Electromechanical Systems, Singly excited systems. Torque and EMF equations.

Unit II

D. C. Machines: EMF and Torque equations, Armature windings, Armature Reaction, Demagnetizing and Cross-magnetizing armature MMF, Interpole and compensating windings, commutation. Characteristics of D.C.generators.

D.C.motors and their characteristics

Starting of D.C.motors. Starter step calculation for a D.C. shunt and series motor. Speed control of D.C. motors. Ward Leonard control. Braking of d.c.motors. Efficiency and testing of d.c. machines, Hopkinson test.

Unit III

1- Ø **Transformers:** Transformer construction and practical considerations. Equivalent circuit, Exact and approximate, per unit values, Phasor diagram, Transformer testing: open circuit test, Short Circuit test, Sumpner's test, Efficiency and voltage regulation, All day efficiency, Auto-transformer.

Unit IV

3 **–** Ø **Transformer:** Three-phase Bank of Single-phase Transformers, Parallel operations of 1 and 3 phase transformers, 3 to 2 and 6 phase conversion. Load division between transformers in parallel. Three winding transformers, Tertiary winding, Tap Changing, Transformers for special purpose, Welding, Traction, Instruments and pulse Transformers.

Books:-

1. Electrical Machines: I. J. Nagrath and D. P. Kothari (Tata McGraw Hill)
2. Electrical Machniery: Fitzerald, Kingsley (McGraw Hill)
3. Electrical Machnies: P. C. Sen

Reference:

1. Electrical Machines and their Applications: J. Hindmarsh
2. Electrical Machines: P. K. Mukherjee & S. Chakravoti (Dhanpat Rai Publications)
3. Electric Machines: Ashfaq Hussain (Dhanpat Rai Publications)

Code No.: ETEE 211 **L T**
Paper: Thermodynamics **3 1**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Brief review of basic laws of thermodynamics, Helmhltz& Gibb's function, Mathematical conditions for exact differentials. The Maxwell Relations, Calapeyron Equation, Joule-Thompson coefficient and Inversion curve. Availability & Irreversibility.

Unit II

Properties of steam. Use of stream table & Mollier Chart. Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Heat balance.

Unit III

Rankine and modified Rankine cycles, working of steam engine Indicator diagram.

Flow through nozzle, variation of velocity, area and sp. Volume, nozzle efficiency, Throat area.

Unit IV

Classification, impulse and reaction turbines, Staging, Stage and overall efficiency, re-heat factor, bleeding, comparison with steam engines. Governing of turbines. Velocity diagram, work done efficiency of reaction, impulse Turbines.

SI and CI engines. Four stroke and two stroke engines Otto, Diesel and Dual cycles, work done, efficiency and indicator diagram.

Books:

1. Heat Engineering by V. P. Vasandani & D. S. Kumar Publisher Metropoilition Books Co. (P) Ltd.
2. Thermal Engg. By P. L. Blallaney, Khanna Publisher

Reference:

1. Theory of Steam Turbine by W. J. Kearton
2. Steam & Gas Turbine by R. Yadav, CPH Allahabad
3. Thermal Engg. By R. K. Rajput, Laxmi Publication
4. Turbine Compression & Fans by S. M. Yahya, TMH
5. Thermal Engg. By S. K. Kulshrestha, Vikas Pub. House Ltd.
6. Heat Engines by R. Yadav
7. Engg. Thermodynamics by C. P. Arora.

w.e.f. 2004-2005

Code No.: ETEE 202 **L T**

Paper: Electro Mechanical Energy Conversion – II 3 1

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Poly phase Induction Machines – I

Construction features, production of rotating magnetic field, phasor diagram, equivalent circuit, torque and power equations, torque-slip characteristics, no load and blocked rotor tests' efficiency. Induction generator.

Poly phase Induction Machines – II

Starting and speed control (with and without e.m.f. injection in the rotor circuit), deep bar and double cage induction motors, cogging and crawling.

Unit II

Single Phase Induction Motor.

Double revolving field theory, equivalent circuit, no load and blocked rotor tests, starting methods, repulsion motor.

A.C.Commutator Motor:

E.M.F. induced in commutator windings, single phase a.c. series motor, Universal motor

Unit III

Synchronous Machines I

Constructional features, armature windings, E.M.F. equation, winding coefficients, harmonics in the induced E.M.F., armature reaction, O.C. and S.C. tests, voltage regulation-Synchronous impedance method, MMF Method, Potier's triangle method and parallel operation, operation on infinite bus, cooling.

Unit IV

Synchronous Machines II

Two reaction theory, power expressions for cylindrical and salient pole machines, performance characteristics.

Synchronous Motor-

Principle of operation, starting methods, phasor diagram torque-angle characteristics, V-curves hunting and dampling, synchronous condenser, reluctance motor.

Books:

1. M.G.Say, "Alternating Current machines", Pitman & Sons.
2. P.S.Bimbhra, "Electric Machinery", Khanna Publishers.

Reference:

1. P.S.Bimbhra, "Generalized Theory of Electrical Machnies", Khanna Publishers.
2. I.J.Nagrath and D.P.Kothari, "Electrical Machnies", Tata McGraw Hill.
3. B.R.Gupta and V.Singhal, "fundamental of Electrical Machines", New Age International.

Code No.: ETEE 204 **L T**
Paper: Analog Electronics **3 1**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

UNIT I

Building Blocks of Analog Ics: Differential amplifier, Op-amp, op-amp parameters, virtual ground, Inverting and non-inverting amplifiers, differential amp, Summers, Instrumentation amplifier, Voltage to current, current to voltage Converter, Integrators, Differentiators current mirrors, Active loads, Level shifters and output stages.

UNIT II

Waveform Generations: Sinewave generator(Phase shift Wein bridge, Hartley & colpitts), Ramp an sawtooth generators, Linearity of waveforms, Astable multi Vibrators, OTA-C Oscillators, Voltage Controlled-Oscillators.

UNIT III

Power Amplifiers: Power dissipations in transistors, Harmonic distortion, Amplifiers Classification, (Class-A, Class-B, Class-C, Class-AB) Efficiency, Push-pull and complementary Push-pull amplifiers, Tuned amplifiers.

Linear & Non Linear Waveshaping: Clipping & Clamping Circuits Comparators, log/antilog circuits using Op-amps, precision rectifiers.

UNIT IV

Active RC Filters: Idealistic & Realistic response of filters (LP, BP, HP), Butter worth & Chebyshev filter functions Low Pass, Band Pass, High Pass, All pass and Notch Filter using Opamps, Operational transconductance amplifier (OTA)-C filters.

Applications of IC Analog Multiplier: IC phase locked loops, IC voltage regulators, IC function generators.

Books:

1. Gayakwad, "Opamps and Linear Integrated Circuits", PHI Pvt. Ltd.
2. Choudhary and Jain**, "**Linear Integrated Circuits", New Age International (P) Limited Publishers.

References:

1. Sedra and Smith, "Microelectronics Circuits", Oxford University Press.

Code No.: ETEE 206 **L T**
Paper: Power System 3 1

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Power System Components:

Concept of active, reactive & complex power, load characteristics, Single line diagram of power system, brief description of power system elements such as, synchronous machine, transformer, transmission line, bus bar and circuit breaker etc.

Fundamentals of power system, single phase 3 Ø transmission and supply systems:

Different kinds of supply system and their comparison, choice of transmission voltage.

Transmission line:

Configurations, type of conductors, Bundle conductors, resistance of line, skin & proximity effects.

Unit II

Overhead Transmission Lines:

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, representation and performance of short, medium and long transmission line, Ferrranti effect, Transposition of transmission lines, surge impedance, surge loading.

Unit III

Corona and Interference:

Phenomenon of corona, corona loss, factors affecting corona, electrostatic and electromagnetic interference with communication lines, methods of reducing corona and interference.

Overhead Lines Insulators:

Types of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential.

Unit IV

Mechanical Design of Transmission Line:

Catenary curve, calculation of sag and tension, effects of wing and ice loadings, sag template, vibration dampers.

Insulated Cables:

Types of cables, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Books:

1. C.L.Wadhava, “Electrical Power Systems”, Wiley Eastern Ltd.
2. M. L. Sone, P. V. Gupta and U. S. Bhatnagar, “A course in Electrical Power”, Dhanpat Rai & Sons.
3. S. L. Uppal, “Electrical Power”, Khanna Publishers.
4. W. H. Stevension, ”Elements of Power System Analysis”, McGraw Hill
5. Ashfaq Hussain, “Electrical Power System” CBS Publishers and Distributiors.

Code No.: ETEE 208 **L T**
Paper: Control Engineering 3 1

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Input / Output Relationship:

Introduction to open loop and closed loop control systems, mathematical modeling and representation of physical systems (Electrical, Mechanical and Thermal), derivation of transfer function for different of types of systems, block diagram & signal flow graph, Reduction techniques, Mason's Gain formula.

Unit II

Time – Domain Analysis

Time domain performance criteria, transient response of first, second & higher order systems, steady state errors and static error constants in unity feedback control systems, error criteria, generalized error constants, performance indices, response with P, PI and PID controllers.

Unit III

Frequency Domain Analysis:

Polar and inverse polar plots, frequency domain specifications, Logarithmic plots (Bode plots), gain and phase margins, relative stability. Correlation with time domain, constant M & N circles, close loop frequency responses, from open loop response.

Unit IV

Concept of Stability:

Asymptotic stability and conditional stability, Routh – Hurwitz criterion, Nyquist stability criterion, Root locus plots and their applications.

Unit V

Compensation Techniques:

Concept of compensation, Lag, Lead and Lag-Lead networks, design of closed loop systems using compensation techniques, feedback compensation using P, PI, PID controllers.

Books:

1. B. C. Kuo, "Automatic control system", Prentice Hall of India
2. I. J. Nagrath & M. Gopal, " Control system Engineering New Age International"
3. S. P.Eugene Xavier, "Modern control systems", S. Chand & Company.
4. K. Ogata, "Modern control Engineering", Prentice Hall of India.

Reference:

1. Norman S. Nise, "Control systems Engineering" John Wiley & Sons (Asia) Singapore.
2. Raymond T. Stefani, Design of Feedback Control System, Oxford University Press.

Code No.: ETEE 210 **L T**

Paper: Electromagnetic Field Theory 3 1

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Electromagnetic Theory: Review of scalar and vector field, Dot and Cross products, coordinates-cylindrical, spherical etc. Vector representation of surface, physical interpretation of gradient divergence and curl, different coordinated systems.

Unit II

Electrostatic Fields: Electric field due to point-charges, line charges and surface charges, Electrostatic potential, Solution of Laplace and Poission's equation in one dimension, M-method of image applied to plain boundaries. Electric flux density, Boundary conditions, Capacitance, Electrostatic energy.

Ampere's law of force, Magnetic flux density, Ampere's circulate law, Boundary conditions, Faraday's law, Energy stored in magnetic fields.

Unit III

Continuity equations, Displacement current, Maxwell's equation, Boundary conditions, Plane wave equation and its solution in conducting and non-conducting media, Phasor notation, Phase velocity, Group velocity, Depth of penetration, Conductors and dielectrics, Impedance of conducting medium. Polarization, Reflection and refraction of plane waves at plane boundaries, Poynting vectors, and Poynting theorem.

Unit IV

Transmission line equations, Characteristic impendence, Distortion-less lines, Input impendence of a loss less line, Open and Short circuited lines, Standing wave and reflection losses, Impedance matching, Application of smith chart.

Books:-

1. Electromagnetic – J.F.D. Kraus
2. Electromagnetic waves and Radiating system – E.C.Jorden, D.G.Balmein

Reference:

1. Electromagnetic – Hayt
2. Electromagnetic – J. D. Kraus, R. C. Keith

Code No.: ETEE 212 **L T**
Paper: Power Station Practice 3 1

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Unit I

Introduction:
Importance of electrical energy, comparison with forms of energy, global energy scenario.

Non-Conventional Energy Sources:
Introduction to Solar energy, geo-thermal energy, tidal energy, wind energy, bio-gas energy and M.H.D. Power generation.

Unit II

Thermal Power Plant:
Location and Site selection, general layout and working of plant, brief description of boilers, economizers, super heaters, draft equipments, fuel and ash handling plant.

Gas Turbine Power Plant: Lay out, Working and components of gas turbine power plant, combined gas and steam turbine plant.

Unit III

Hydro Electric Plant:
Location and site selection, general layout and operation of plant, Impulse, Reaction, Francis and Kaplan turbines, governing of turbines.

Diesel Power Plant:
Layout and components of plant auxiliary equipments.

Unit IV

Nuclear Power Plant:
Location and site selection, general layout and operation of plant, brief description of reactors, moderators and reflectors.

Substation Layout:
Types of substations, bus-bar arrangements, typical layout of substations, substation equipments.

Power plant Economics and Tarrifs:
Load curve, load duration curve, factors affecting cost of generation, tarrifs, depreciation, effect of low power factor and its improvement.

References:

1. M. V. Deshpande, “Elements of Electric Power Station Design”, Wheeler Publishing Co.
2. B. R. Gupta, “Generation of Electrical Energy”, Eurasa Publishing House.
3. B. G. A. Skrotzki & W. A. Vopat, “Power Station Engineering and Economy”, Tata McGraw Hill.
4. S. L. Uppal, “Electrical Power”, Khanna Publishers.
5. M. L. Soni, P. V. Gupta and U. S. Bhatnagar, “A Course in Electrical Power”, Dhanpat Rai & Sons.