Engineering Maths – III [EM-III]

S.E. Sem. III [BIOM/INST/ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	–
Term Work	–	–

SYLLABUS

1. Laplace Transform

Functions of bounded variations.

Laplace Transforms of 1, t^n, e^{at}, sin at, cos at, sinh at, cosh at, erf (t) Linear property of L.T. First shifting theorem, Second shifting theorem,

$$L\left\{t^n f(t)\right\}.L\left\{\frac{f(t)}{t}\right\}.L\left\{\int_0^t f(u)du\right\},L\left\{f^n(t)\right\}$$

Change of scale property of Laplace Transforms Unit step function, Heavy side, Dirac delta functions, Periodic functions and their Laplace Transforms.

(a) Inverse Laplace Transforms : Evaluation of inverse L.T., partial fractions method, convolution theorem.

(b) Applications to solve initial and boundary value problems involving ordinary differential equation with one dependant variable.

2. Complex Variables

Functions of complex variables, continuity and derivability of a function, analytic functions, necessary condition for f(z) to be analytic, sufficient condition (without proof), Cauchy-Riemann conditions in polar forms. Analytical and Milne-Thomson method to find analytic functions f(z) = u + iv where (i) u is given (ii) v is given (iii) u + v (iv) u–v is given. Harmonic functions and orthogonal trajectories.

(a) Mapping : Conformal mapping, Bilinear mapping, fixed points and standard transformation, inversion, reflection, rotation and magnification.

(b) Line Integral of function of complex variable, Cauchy's theorem for analytical function (with proof), Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's Integral formula and deduction.

(c) Singularities and poles : Taylor's and Laurent's development (without proof), residue at isolated singularity and it's evaluation.

(d) Residue theorem application to evaluate real integrals of type

$$\int_0^{2\pi} f(\cos\theta,\sin\theta)d\theta \text{ and } \int_{-\infty}^{+\infty} f(x)dx$$

3. Fourier series

Orthogonality and orthogonal functions, Expression for the function in a series of orthogonal functions. Dirichlet's conditions, Fourier series of periodic functions with period 2pi or 2ℓ. (Derivation of Fourier coefficients a0, an, bn is not expected) Dirichlet's theorem Even and Odd functions. Half range sine and cosine expressions Parsaval's identities (without proof).

(a) Complex form of Fourier Series : Fourier transform and Fourier integral in detail.

Reference :

1. Textbook of Applied Mathematics (*Wartikar P.N., Wartikar J.N.*) Pune Vidyarthi Griha Prakashan, 1981.
2. Advanced Engineering Mathematics (*Kreyszig Erwin*) Wiley Student Edition – New Delhi, 2006 (8^{th} Edition).
3. Complex Variables (*Churchil*) McGraw Hill.
4. Theory of Function Complex Variable (*Shantinarayan*) S. Chand & Co.
5. Engineering Mathematics (*Shastri S.S.*) Prentice Hall.
6. Advanced Modern Engineering Mathematics (*Glyn James*) Pearson Education Ltd., 2004 (3^{rd} Edition)

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Power Plant Engineering [PPE]

S.E. Sem. III [ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Introduction**
   Conventional and non conventional sources of energy Structure of power industry.

2. **Economics of the Power Plant**
   Load curve, load duration curve, various factors and effects of fluctuating load on operation and design of plant, methods of meeting fluctuating load. Selection of generating equipment, load shearing cost of electrical energy, tariff methods, performance and operating of power plants.

3. **Thermal Power Plant**
   Fuels and their handling, combustion process–fluidized bed combustion, typical layout of power plant, components, working efficiency of thermal power plant, selection criteria

4. **Hydro Power Plant**
   Rainfall, run off and its measurement, hydrograph, flow duration curve mass curve reservoir storage capacity, classification of plants–run off river plant, storage river plant, pumped storage plant.

5. **Nuclear Power Plant**
   Introduction of nuclear engineering – radioactive decay, half life fission, fusion, nuclear material, thermal fission reactor and power plant – PWR BWR, liquid metal fast breeder reactors, reactor control

6. **Diesel and Gas Turbine Power Plant**
   General layout, application of diesel power plant, advantages and disadvantages component, performance of gas turbine power plant, gas turbine material.

7. **Environmental Impact of Power Plant**
   Social and economical issue of power plant, green house effect, Acid precipitation – acid rain and acid snow, dry deposition and acid fog thermal pollution, air pollution, radiation from nuclear power plant effluents.

8. **Renewable Energy Sources**
   Solar energy: most common type of plant solar energy and the environment, solar active and passive collector, solar thermal power plant, parabolic trough solar dish and solar power tower.
   Wind energy: basic, advantages, component of wind electric generator, wind farms, comparison with other energy, limitation efficiency, geothermal energy, tidal energy.

Reference :

1. Elements of Power Station Design (*M.V. Deshpande*) Tata McGraw Hill.
2. Engineering Thermodynamics (*D.H. Bacon*) London Butterworth.
3. Power Plant Engineering − Stream & Nuclear (*P.K. Nag*) Tata McGraw Hill.
4. Power Plant Engineering (*Fredrick T. Morse*) East West Press Pvt. Ltd.
5. Power Plant Engineering (*Mahesh Varma*) Metrolitan Book Co. Pvt. Ltd.
6. Direct Energy Conversion (*George W. Sutten*) Latur University, Electronics Series Vol. 3, McGraw Hill.

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Basic Electronics [BE]

S.E. Sem. III [ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	2 Hrs.	50
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Types of Diodes and Applications**
   Types of diodes: Zener, Varactor, Schottkey and PIN diodes.
   Rectifier and Filter Analysis: specification of the devices and components required for C, L, LC, CLC & RC filter.
   Clippers and clampers: Single and double ended clipping circuits, clamping circuits, voltage doubler circuit.

2. **Bipolar Junction Transistor:**
   Biasing Circuits: Types, dc circuit analysis, load line, thermal runaway, stability factor analysis, thermal stabilization and compensation.
   Modeling: Small signal analysis of all configurations with different biasing network using h–parameter model. Introduction to r_e–model and hybrid–pi model.
   Amplification: Derivation of expression for voltage gain, current gain, input impedance and output impedance of CC, CB, CE amplifiers.

3. **Field Effect Transistor:**
   JFET and MOSFET : Types, construction and their characteristics, Biasing circuits for FET amplifiers, FET small signal analysis, derivation of expressions for voltage gain and output impedance of CS and CD amplifiers.

4. **Low and High Frequency Analysis of BJT and JFET amplifier circuits.**

5. **Feedback Amplifiers** (Negative Feedback) : Introduction to positive and negative feedback, negative feedback– current, voltage, Series and Shunt type. It's effect on input impedance, output impedance, voltage gain, current gain and bandwidth.

6. **DC and AC analysis of differential amplifier,** single and dual inputs and balanced and unbalanced outputs using BJT. FET differential amplifier.

7. **Optoelectronic devices:** Photoconductive, photo emissive and photovoltaic devices, principle, construction and applications, LED, photodiode, phototransistor, solar cell, optoisolators

Reference :

1. Electronic Devices and Circuits (*Robert Boylested and Louis Nashelsky*) Prentice-Hall of India.
2. Electronic Devices and Circuits (*Millman and Halkias*) Tata McGraw Hill.
3. Electronic Devices (*Thomas Floyd*) Prentice-Hall of India.
4. OP-AMPs and Linear IC's (*Ramakant A. Gayakwad*).
5. Electronic Circuit Analysis and Design (*Newman D.A.*) McGraw Hill Int. (2nd Edition).
5. Electronic Devices and Circuits (*David Bell*) Oxford University Press.

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Electrical Network [EN]

S.E. Sem. III [ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. **Network Theorems**
   Solution of network using dependent sources, mesh analysis, super mesh analysis, nodal analysis, super node analysis, superposition theorem, Thevenin's theorems and Norton's theorem, maximum power transfer theorem. Solution of network with A.C. sources: mesh analysis, nodal analysis, superposition theorem, Thevenin's theorems and Norton's theorem, maximum power transfer theorem, Tellegen's theorem, Millman's theorem, reciprocity theorem, magnetic coupling.

2. **Graph Theory and Network Topology**
   Introduction, graph of network, tree, co–tree, loop incidence matrix, cut set matrix, tie set matrix and loop current, number of possible tree of a graph, analysis of network, Network equilibrium equation, duality, general network transformation.

3. **First Order Differential Equations**
   General and partial solutions, time constant, integrating factor more complicated network, initial conditions in elements geometrical interpretation of derivative, procedure for evaluating initial condition, initial condition of networks.

4. **The Laplace Transform**
   The Laplace transform and its application to network analysis, transient and steady state response to step, ramp, impulse and sinusoidal input function, transform of other signal waveform, shifted step, ramp and impulse function, waveform synthesis.

5. **Network Function; Poles and Zeros**
   Terminal pairs or ports, network functions for one port and two ports, the calculation of Network functions, ladder network General network, poles and zeros of network functions, restrictions on Pole and Zero locations for driving point functions, restrictions on Pole and Zero locations for Transfer functions, time domain behavior from pole and zero plot.

6. **Two Port Parameters**
   Relationship of two port variables, short circuit admittance parameters, open circuit admittance parameters, transmission parameters, the hybrid Parameters, relationships between parameter sets, parallel connection of two port networks.

7. **Network Synthesis**
   Properties of positive real function, testing of positive real functions, driving point synthesis of LC, RC, RL network.

Reference :

1. Network Analysis (*M.E. Van Valkenburg*) Printce Hall India Pvt. Ltd. (3rd Edition).
2. Networks and Systems (*Choudhary D. Roys*) New Age International Publisher.
3. Engineering Circuit Analysis (*Hayt W.H. Jr. and Kammerly J.E.*) TMH (5th Edition).

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Electrical Measurement and Measuring Instruments [EMMI]

S.E. Sem. III [ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Units and standards:** Errors in measurements, system of units, Dimensions of electrical qualities in CGS & SI units.

2. **Galvanometers:** D.C. permanent magnet moving coil type, ballistic galvanometer, flux meter. A.C. Vibration Galvanometer. (only the basis working principle)

3. **Potentiometers:** Principle of D.C. potentiometer (only Crompton's type) & its applications.

4. **A.C. bridge methods:** A.C. bridge circuits for measurements of self inductance, capacitance, Q factor & frequency. (only the basic type)

5. **magnetic properties of materials:**
   The magnetic dipole moment of current loop, diamagnetism, the origin of permanent magnetic dipoles in matter, paramagnetism, ferromagnetism.

6. **Magnetic measurements:**
   Hysterisis loop & B–H curve determination (using step by step method), A.C. power loss in sheet steel by wattmeter method (Epstein square and Llyod – Fisher square).

7. **Measuring instruments:**
   General features of indicating, recording and integrating type of instruments, principles of moving iron, moving coil, rectifier, thermocouple type ammeter and voltmeter, electrostatic voltmeter, extension of ranges for moving coil ammeters and voltmeters, theory of dynamometer type wattmeter, principle of induction type energy meters, errors, testing and adjustments, principles of power factor meter, (dynamometer type only) frequency meters (reed type and moving coil type) and synchroscope (Weston type only).

8. **Instrument transformers:**
   Theory of current and potential transformers – definition, importance and applications only, definition of Ratio and Phase Angle errors (no derivations).

Reference :

1. A course in Electrical & Electronic Measurement & Instrumentation (*Sawhney A.K.*) Dhanpat Rai & Sons, 1993.
2. Electrical Measurements & Measuring Instruments (*Golding E.W.*) Wheeler Publishing, 1994 (5th Edition).
3. Electrical Engineering Materials (*Dekker A.J.*) Prentice Hall − India, 1987 (12th Edition).

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Numerical Techniques [NT]

S.E. Sem. III [ELEC]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Errors in Numerical Computation**
   Error types, analysis and estimation, error propagation.

2. **Roots of Equations**
   The bisection method, the false position method, the Newton–Raphson method, The Secant method.

3. **System of Linear Algebraic Equations**
   Gauss–Elimination method, Gauss–Jordan method. LU decomposition and matrix inversion. Gauss–Sedial method.

4. **Curve Fitting**
   Interpolation – Newton's divided difference, Lagrange Interpolating polynomials, approximation – least square approximation techniques, linear regression and polynomial regression.

5. **Numerical Differentiation**
   Methods based on interpolation and finite differences.

6. **Solution to Ordinary Differential Equation**
   Picard's method, Euler's method, Modified Euler's method, Predictor – corrector method, Adams – Bashforth method.

7. **Optimization :**
   One–dimensional unconstrained– Golden–section search, quadratic interpolation, Newton's method, linear programming – graphical solution, simplex method.

8. **Numerical Integration :**
   Simpson's 1/3rd rule, Simpson's 3/8th rule.

Reference :

1. Numerical Methods for Engineers (*Chappa Seven C., Canale R.P.*) Tata McGraw Hill.
2. Numerical Methods for Engineers (using MATLAB and C), Thomson Asia Pvt. Ltd.

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