# BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
## III SEMESTER

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**Note:**

*marks refer to mid semester evaluation and end semester evaluation.
AS 301
Engineering Mathematics – III

External: 50
Sessional: 50
Credits : 4
Course Duration: 45 lectures of one hour each.

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART A


Eigen values, eigen vectors, Cayley – Hamilton theorem (statement only). Similarity of matrices, Basis of eigenvectors, diagonalization (Scope as in Chapter 7, Sections 7.1, 7.5 of Reference 1).

(8 Lectures)

(7 Lectures)

PART B

Complex Functions: Definition of a Complex Function, Concept of continuity and differentiability of a complex function, Cauchy – Riemann equations, necessary and sufficient conditions for differentiability (Statement only). Study of complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, real and imaginary part of trigonometric and hyperbolic functions, Logarithmic functions of a complex variable, complex exponents (Scope as in Chapter 12, Sections 12.3 – 12.4, 12.6 – 12.8 of Reference 1).

Laurent Series of function of complex variable, Singularities and Zeros, Residues at simple poles and Residue at a pole of any order, Residue Theorem (Statement only) and its simple applications (Scope as in Chapter 15, Sections 15.1 – 15.3 of Reference 1).

Conformal Mappings, Linear Fractional Transformations (Scope as in Chapter 12, Sections 12.5, 12.9 of Reference 1).

(8 Lectures)

(7 Lectures)

(8 Lectures)

References:

EE- 301

ELECTRIC MACHINERY-I

External: 50
Sessional: 50
Credits: 4

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Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Transformers

(10 hours)

2. Direct Current Machines
   Generators: Mechanical construction, Armature windings, Induced emf equation, Developed torque, Magnetization characteristics, Theory of commutation, Armature reaction, Types of d.c. generators, Voltage regulation, Losses, Separately excited, shunt, series and compound generators and characteristics, Maximum efficiency criterion.

(10 hours)

Part-B

3. Polyphase Induction Machines
   Induction Generator: Motor to generator transition, Induction generator starting and operation with other three phase sources, isolated generator operation and voltage build up. [Hubert: 5.18]

(15 hours)

4. Single Phase Induction Motors
   Double revolving field theory, Analysis of single phase induction motor and speed torque characteristics, Split Phase, Capacitor start, Capacitor start capacitor run motor, Permanent split capacitor motor, Shaded pole motor, Testing of single phase induction motor: No load and block rotor tests. [Guru-Hiziroglu:10.1-10.4, 10.6-10.7]

(8 hours)

Text book:


Other Recommended Books:

EE- 351

ELECTRIC MACHINERY-I LAB

Marks: 50
Credits: 2

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Note: At least eight experiments to be done.

1. Open circuit and short circuit test of single phase/ three phase transformer and obtain its equivalent circuit.
2. Parallel operation of two single phase transformers.
4. Different winding connections of three phase two winding transformer and to identify proper combination for parallel operation.
5. Parallel operation of two three phase transformers.
8. Efficiency at different loads of the given dc shunt machine through swinburne / load test.
9. Speed control characteristics of a given dc shunt motor by (i) Armature control (ii) Field control.
10. No load and blocked rotor test on a three phase induction motor and to obtain its Equivalent circuit
11. Torque speed characteristics of three phase induction motor.
EE-302

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

External: 50
Sessional: 50
Credits : 4

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3 1 0

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part A

1. Units, Dimensions and Standards:

Introduction to MKS & Rationalised MKSA System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Systematic errors

2. General Theory of Analog Measuring Instruments:
Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, dynamometer, induction, thermal, etc. for dc & ac measurement of V, I, W, frequency, phase & power factor etc., energy meter, their sources of error & compensation, shunts & multipliers, multi-meter.

3. Potentiometers:
Basic Potentiometer circuit, multiple range potentiometers, constructional details of potentiometers, applications of d-c potentiometers; self balancing potentiometers. A-C potentiometers, polar and co-ordinate types.

Part B

4. Bridges:

5. Magnetic Measurements:
Flux meter, B-H Curve, Hystersis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods.

6. Instrument Transformers:
Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of CTs. & PTs., Testing of CTS & PTS.

BOOKS RECOMMENDED

2. Electronic Inst. & Measurement techniques. By W.D. Cooper.
EE-352

ELECTRICAL MEASUREMENTS & INSTRUMENTATION LAB.

Marks: 50
Credits: 1

Note: At least eight experiments to be done.

List of experiments:

1. Study of principle of operation of various types of electromechanical measuring instruments.
6. Plotting of Hysteresis loop for a magnetic material using flux meter.
7. Measurement of frequency using Wein's Bridge.
8. To study the connections and use of Current and potential transformers and to find out ratio error.
9. Determination of frequency and phase angle using CRO.
11. To find 'Q' of an inductance coil and verify its value using Q-meter.
EE- 303

Linear Circuit Analysis

External: 50  
Sessional: 50  
Credits : 4  
L T P 3 1 0

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

1. Methods of analyzing A.C. Circuits
   
   Nodal Analysis: Node voltages, matrix node equations
   Mesh Analysis: Mesh currents, matrix mesh equations
   Network Theorems: Superposition, Thevenin’s, Norton’s, Maximum Power Transfer
   (10-hours)

2. Network Topology
   
   Introduction, Network Graph, Tree and Co-tree, Twigs and Links, Incidence Matrices and its properties, Link currents: Tie-Set Matrix, Cut-Set and Tree Branch Voltages
   (7-hours)

3. Two-Port Networks
   
   Introduction, Open Circuit Impedance Parameter, Short Circuit Admittance Parameter, Transmission Parameter, Inverse Transmission Parameter, Hybrid Parameter, Interrelationship of different parameters, Inter-Connection of Two-Port Networks, Terminated Two-Port Network, T and Π representation.
   (8-hours)

PART-B

1. Laplace Transform Analysis

   Definition of Laplace Transform, Step function, Impulse function, Periodic function, Inverse transform, Initial and Final value theorem, Circuit Elements in the S-Domain,
   
   Transfer Functions: Circuit Analysis, Convolution and Impulse Response
   (10-hours)

2. Network Functions and s- Domain Analysis

   Complex Frequency and its Physical Interpretation, Transform Impedance and Transform Circuits, Series and Parallel Combination of Elements, Terminal Ports.
   
   Network Functions: Network functions for One-Port and Two-Port Networks, Poles and Zeros and their Significance, Properties and Necessary Conditions of Driving Point Functions and Transfer Functions, Routh Criteria
   (10-hours)

Text Book


Other Recommended Books

1. To make 3-phase unbalanced network with neutral return of known impedance. Measure phase currents, neutral currents and the potential difference between the load and supply neutral. Verify the results theoretically.

2. To determine phase sequence of three phase supply system and to find the line currents for three phase three wire load when the sequence is i) RYB ii) RBY. Verify the results theoretically.

3. To study the current build up and current decay in RL / RC circuit by obtaining its response to a square wave input.

4. To check the polarity marking of a transformer and to determine self inductance of each winding and mutual inductance between the windings.

5. To study the resonance in R-L-C circuit, and to measure Q-factor of the coil.

6. To find the various two port network parameters (open circuit, short circuit, transmission and hybrid parameters)

7. For a circuit supplied from a non-sinusoidal source verify the following current and voltage relations:

\[ V^2 = V^2_{dc} + V^2_1 + V^2_2 + \ldots \]
\[ I^2 = I^2_{dc} + I^2_1 + I^2_2 + \ldots \]

8. To analyze a complex waveform.

9. To obtain capacitor voltage vs. time curve and time constant of an RC circuit when
   i) It is switched on to dc supply
   ii) Capacitor is discharged through the resistance

10. PSpice simulation of circuits to obtain steady state response for dc and ac excitation
11. PSpice simulation for transient response of circuits
12. PSpice simulation of unbalanced three phase circuits and for circuits with mutual inductance
EE – 304
SEMICONDUCTOR AND DIGITAL ELECTRONICS

External: 50
Sessional: 50
Credits : 4

Note: Examiner shall set eight questions four from each part. Candidate will be required to attempt any five questions selecting at least two questions from Part A and Part B.

Part-A

1. Transistor at low frequencies: (08)
   Graphical analysis of CE configuration two port devices and hybrid model, h-parameters, comparison of amplifier configurations of circuits

2. Transistor biasing and Thermal stabilization: (08)
   Concept of biasing & biasing of BJT circuits, Operating point, bias stability, stabilization against variation in Ico, Vbe, and β, thermal run away, thermal stability.

3. Power amplifiers: (10)
   Classification of amplifiers, Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers, Efficiency of amplifiers, Push pull amplifiers (class A & class B).

Part-B

4. Data Converters: (5)
   Sample & Hold switch, D/A converters, weighted resistor type, R-2R Ladder type, A/D converters: Counter-Ramp type, Dual Slope type, Successive Approximation type, Specifications of ADC & DAC.

5. Digital Logic Families: (10)
   Characteristics of digital circuits: fan in, fan-out, power dissipation, propagation delay, noise margin, Transistor-transistor logic (TTL), Manufacturer Data Sheets & Specifications, Types of TTL gates (Schottky, standard, low power, high speed),Emitter Coupled logic (ECL), Manufacturers Data Sheets & Specifications, Comparison of characteristics of TTL, ECL, Tristate Logic & its applications.

6. Semiconductor Memories & Programmable Logic: (4)
   ROM, PROM, EPROM, EEPROM, RAM: Static RAM, Typical Memory Cell, Memory Organisation, Dynamic RAM cell, Reading & Writing Operation in RAM, PLA & FPGA.

Books Recommended:

- Integrated Electronics Millman & Halkias (Mc-Graw Hill)
- Microelectronic Circuits AS Sedra & KC Smith (OXFORD)
- Electronics Devices & Circuit Theory RL Boylestad & L Nashelsky (PHI)
- Digital Electronics Taub Schilling
- Digital Logic Design Morris Mano
- Digital System Principles & Applications R J Tocci (PHI)
EE - 354

SEMICONDUCTOR AND DIGITAL ELECTRONICS LAB

Marks: 50
Credits: 1

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Note: At least six experiments to be done.

1. To study the specification sheet & draw the characteristics of transistor in CB or CE configuration.
2. To draw the frequency response of a single stage BJT amplifier.
3. To measure the voltage and current gain of a BJT amplifier.
4. To measure the distortion in the output of a push pull amplifier.
5. To study the data sheets of TTL and ECL gates.
6. To convert 8 bit digital data to analog value using DAC.
7. To convert analog value into 8 bit digital data using ADC.
8. Verify the truth tables of/with various gates, RS, D, JK Flip Flops.

To simulate the following using P-spice

1. Frequency Response of a single state FET amplifier.
2. Voltage and current gain of BJT amplifier.
3. Distortion of a push pull power amplifier.