1/4 B.Tech. FIRST SEMESTER

EM1T5 **NETWORK THEORY** **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Course Objectives:

- To introduce basic circuit concepts of DC Circuits
- To study network theorems for simplifying complex circuit analysis
- To familiarise about AC fundamentals
- To analyse transient affects in electric circuits**.**
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Learning Outcomes:

The student will be able to

- Understand the theorems.
- analyze the Circuits.
- simplify complex circuits.

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Star delta conversion - Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent sources, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only with independent sources.

UNIT – II

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Superposition, Maximum Power Transfer theorems, - problem solving using independent sources.

UNIT-III

Analysis of first and second order circuits with DC excitation

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, problem solving using R-L, RC & RLC elements with DC excitation.

UNIT-IV

A.C Fundamentals: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor-problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, problem solving

UNIT-V

Steady State Analysis of A.C Circuits : Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series and parallel R-L, R-C, R-L-C circuits problem solving. Transient response of R-L, R-, R-L-C circuits for sinusoidal AC excitation.

UNIT – VI

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – VII

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, Bandwidth of parallel resonance, general case- resistance present in both branches,

UNIT – VIII

Two-port networks : Relationship of two port networks, Z-parameters, Y-parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks.

Filters : L.P.F, H.P.F, B.P.F, Band Elimination, All pass prototype filters design.

Learning resources

TEXT BOOKS :

1. Fundamentals of electric circuits by Charles K Alexander, Mathews N.O.Sadikar, TMH
2. Network theory by A.Sudhakar & Syam Mohan, S. Pillai, TMH
3. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.

REFERENCES :

1. Electric Circuit Analysis by Hayt and Kimbarle, TMH
2. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
3. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
4. Network Analysis and Filter Design by Chadha, Umesh Publications.