EE302PC: ELECTRICAL CIRCUIT ANALYSIS

II Year B.Tech. EEE I-Sem

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Prerequisite: Mathematics - II (Ordinary Differential Equations and Multivariable Calculus) & Basic Electrical Engineering

Course Objectives:
- To understand Magnetic Circuits, Network Topology and Three phase circuits.
- To analyze transients in Electrical systems.
- To evaluate Network parameters of given Electrical network
- To design basic filter configurations

Course Outcomes: At the end of this course, students will demonstrate the ability to
- Apply network theorems for the analysis of electrical circuits.
- Obtain the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyze two port circuit behavior.

UNIT - I
Network Theorems: Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks.

UNIT - II
Solution of First and Second order Networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC Excitations.

UNIT - III
Sinusoidal Steady State Analysis: Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT - IV
Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

UNIT - V
Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

TEXT BOOKS:
1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

REFERENCE BOOKS:
1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
3. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.