

1/4 B.Tech - SECOND SEMESTER

EC2T3

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 analysis concepts of DC Circuits
- To study network theorems for simplifying complex circuit analysis
- To familiarise about AC fundamentals
- To analyse transients affects in electric circuits

UNIT-I

Methods of Analysis:

Network reduction techniques- star-to-delta & delta-to-star transformation, Source transformation. Nodal analysis, mesh analysis, super node and super mesh, Nodal Versus Mesh Analysis for D.C excitations.

UNIT-II

Network Topology:

Definitions of branch, node, graph, directed graph, connected graph, planar graph, non planar Graph, tree, cotree, twigs, links. Incidence matrix, properties of incidence matrix, incidence Matrix and KCL, Tieset Matrix, Cut-set & Tree branch voltages.

UNIT-III

Network Theorems-I:

Linearity Property, Superposition Principle, Superposition, Thevenin's and Norton's theorems using Dependent sources only.

UNIT-IV

Network Theorems-II:

Maximum Power Transfer Theorem, Millman's theorem, Tellegen's, Reciprocity and compensation theorems for D.C Excitation.

UNIT-V

Two Port Networks:

Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Interconnection of Two-Port networks.

UNIT-VI

Single Phase A.C Circuits:

Sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J-notation, R.M.S, Average values and form factor for different periodic wave forms

UNIT-VII

Time Response of Circuits (DC Excitation):

Time(Transient) response of R-L, R-C, R-L-C series circuits for Zero input, Step input, pulse input -

Initial conditions-solution method using differential equation and Laplace transforms.

UNIT-VIII

Steady State Analysis:

Steady state analysis of R,L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance Susceptance and Admittance-Power Factor and significance-Real and Reactive power, Complex Power.

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

Learning resources

Text Books:

1. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
2. "Circuits & Networks Analysis & Synthesis", A. Sudhakar and Shyammoan S Palli, Tata McGraw- Hill.
3. "Engineering Circuit Analysis", William Hayt and Jack E.Kemmerley,McGraw Hill Company, 6th edition

References:

1. "Fundamentals of Electric Circuits"CharlesK.Alexander, Mathew N.O.Sadiku,Tata McGraw-Hill.
2. "3000 Solved Problems in Electrical Circuit" Schaum's solved problem series Tata McGrawHill.
3. "Circuit Theory", A.ChakrabartiDanapatRai& Co publisher.
4. "Network Analysis ",N.C.Jagan, C.LakshmiNarayana, BS publications, 2nd edition