EC - 305 Network Analysis

Unit-I

Introduction to circuit elements R, L, C and their characteristics in terms of linearity and time dependence, KCL and KVL analysis, dual networks, analysis of magnetically coupled circuits, Dot convention, coupling co-efficient, Tuned circuits, Series and parallel resonance, voltage and current sources, controlled sources.

Unit-II

Network topology, Concept of Network graph, Tree, tree branches and links, cut set and tie set schedules. Network Theorems – Thevenin, Norton, Superposition, Reciprocity, Compensation, Maximum power transfer and Millmans theorems, problems with controlled sources.

Unit-III

Transient analysis: Transients in RL, RC and RLC circuits, initial conditions, time constants, networks driven by constant driving sources and their solutions.
Steady state analysis: - Concepts of phasors and vectors, impedance and admittance. Node and mesh analysis of RL, RC and RLC networks with sinusoidal and other driving sources. Resonance Circuits.

Unit-IV

Frequency domain analysis – Laplace transform solution of Integral-differential equations. Transform of waveform – step, ramp, Gate and sinusoidal functions. Initial and final value theorem. Network Theorems in frequency domain. Fourier Series, Trigonometric & exponential form of fourier series, Fourier series of basic functions.

Unit-V

Network function & Two port networks concept of complex frequency.Network functions of one and two ports, poles and zeros network of different kinds. Necessary conditions for driving point & transfer function.

Two port parameters– Z, Y, ABCD, hybrid parameters, their inverse and image parameters, relationship between parameters. Interconnection of two port networks, Terminated two port networks.

References:

1. M.E. Van Valkenburg: Network Analysis, PHI
2. Mesereau and Jackson: Circuit Analysis- A system Approach, Pearson.
3. Hayt W.H. & J.E. Kemmerly: Engineering Circuit Analysis, TMH
4. Decarlo lin: Linear circuit Analysis, Oxford
5. William D Stanley : Network Analysis with Applications, Pearson Education
6. Roy Choudhary D: Network and systems, New Age Pub
7. Chakraborti: Circuit Theory, Dhanpat Rai.

List of experiments (Expandable)

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software.

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Perform Open Circuit Test on Two Port Network.
7. To Perform Short Circuit Test on Two Port Network.
8. To Find Frequency Response of LRC Series Circuit.
9. To Find Frequency Response of LRC parallel Circuit