

NETWORK ANALYSIS AND SYNTHESIS

(Common to ECE, EEE)

Course Code:13EE1104

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Pre requisites:

Knowledge of Mathematics and Basic Network Analysis.

Course Outcomes:

At the end of the course, the student will be able to:

- CO 1** Solve the Network problems using Graph theory, acquire the knowledge of Network Topology and Duality in Electrical Networks.
- CO 2** Analyze the Networks using Differential Equation Approach and acquire the knowledge of RLC- Series & Parallel circuits, for different Excitations.
- CO 3** Evaluate the Networks using Laplace Transforms Approach.
- CO 4** Analyze the Network functions, Two Port Networks and Ladder Networks.
- CO 5** Design and Evaluate the LC, RC & RL Networks using Foster's and Cauer Forms.

UNIT-I

(12 Lectures)

NETWORK TOPOLOGY:

Linear Graphs in Electrical Networks, Basic Definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-Set Matrices, Graph Theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks.

UNIT-II**(12 Lectures)****NETWORK ANALYSIS - I (DIFFERENTIAL EQUATION APPROACH):**

Network elements, Initial and final conditions (Constant flux linkage and Charge theorems), Step and Impulse response of RC & RL Circuits (Concept of time constant), Solution of RLC- Series & Parallel circuits for the step and impulse excitations, Analysis of Transformer (Mutual Inductance).

UNIT-III**(12 Lectures)****NETWORK ANALYSIS USING LAPLACE TRANSFORMS:**

The Transformed Circuit, Thevenin's and Norton's Theorems, The system function (with poles and zeros), the step and impulse responses, the convolution Integral, The Duhamel Superposition Integral.

UNIT-IV**(12 Lectures)****NETWORK ANALYSIS – II (TWO- PORTS) :**

Network functions, Two Port Networks: Z, Y, h and T (ABCD) Parameters, Relationship between Two Port parameters, Transfer function using two port parameters, inter connection of two port networks, Analysis of Ladder networks.

UNIT-V**(12 Lectures)****SYNTHESIS OF NETWORKS:**

Causality and stability, Hurwitz polynomials, Positive Real Functions, Elementary Synthesis procedure, Properties of LC immittance functions, Synthesis of LC driving point function by Foster's and Cauer Forms, Properties of RC & RL driving Point Function, Synthesis of RC & RL functions Foster's and Cauer Forms.

TEXT BOOKS:

1. N.C. Jagan and C. Lakshmi Narayana, “*Network Analysis*”, B.S. Publications, 2nd Edition, 2008. (Unit-I).
2. Franklin F.Kuo, “*Network Analysis and Synthesis*”, Wiley International, 5th Edition, 2012. (Unit-II to Unit-V).

REFERENCES:

1. M.E. Van Valkenburg, “*Network Analysis*”, Prentice Hall of India Pvt. Ltd., 2000.
2. M.E. Van Valkenburg, “*Introduction to Modern Network Synthesis*”, Wiley Eastern Limited, 1993.
3. Charles K. Alexander, Mathew N.O Sadiku, “*Fundamentals of Electric Circuits*” TMH Education Pvt. Ltd, 3rd Editions, 2008.

