

## S.E. (ELECTRONICS) SEMESTER III

### ELECTRICAL NETWORK ANALYSIS AND SYNTHESIS

Period per week	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical	---	---
	Oral Examination	---	---
	Term Work	---	25
	<b>TOTAL</b>	---	125

Detailed Syllabus		Lectures/Week
1	<p><b>Circuit analysis (ac and dc):</b> Kirchoff's law, Loop variable analysis, Node variable analysis, Source transformations, Reference directions for current and voltage, Active element conventions, dot convention for coupled circuits. Linearity, Superposition, Thevenin's and Norton's, Maximum power for ac source and dependent source.</p>	12
2	<p><b>Linear graphs:</b> Introductory definitions, The incidence matrix A, the loop matrix B, relationship between sub matrix of A and B. Cut-sets and cut-set matrix, Fundamental cut-sets and fundamental tie-sets, Planar graphs, A and B matrices, Loop, node, node pair equations, duality.</p>	08
3	<p><b>Laplace transforms:</b> Properties of Laplace transforms, basic theorems, Laplace transform of gate function, impulse function and periodic functions, convolution integral, inverse Laplace transform, application of Laplace transforms to solution of Network problems.</p>	08
4.	<p><b>Transient and frequency analysis:</b> Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for d.c. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform methods of solutions. Transfer function. Concept of poles and zeros. Concept of frequency response of a system</p>	10

5.	<b>Two port networks:</b> Concept of two port networks, Driving point and Transfer functions., open circuit and short circuit parameters, transmission and inverse transmission parameters, hybrid parameters, inter-relationship of different parameters, interconnection of two port networks, T and pi representation, terminated two port networks	08
6.	<b>Fundamentals of network synthesis:</b> Realizability concept, Hurwitz property , positive realness, properties of positive real functions, testing positive real functions, Synthesis of R-L, R-C and L-C driving point functions – Foster and Cauer forms.	08

**Textbooks:**

1. Franklin F. Kuo, "Network analysis and synthesis", PHI.
2. M. E. Vanvalkenberg, "Network analysis", PHI, third edition.
3. Wiliam Hayt and Jack Kemmerly, " Engineering Circuit analysis", TMH.

**Reference Books:**

1. Circuits and Networks – Analysis and Synthesis: A. Sudhakar and S.P Shyam Mohan.
2. D. Roy Choudhury: Networks and Systems, New Age International Pubs.

**Termwork:**

The Termwork shall consist of at least four experiments and four assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

**SUGGESTED LIST OF EXPERIMENTS**

1. Verification of superposition theorem using ac/dc source.
2. Verification of Thevenin's theorem using dependent/independent source.
3. Verification of maximum power transfer theorem using ac/dc source.
4. Verification of source transformation.
5. Charging and discharging of a capacitor.
6. Measurement of h parameters.

