

# Electrical Network Analysis and Synthesis [ENAS]

S.E. Sem. III [BIOM]

## EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	2 Hrs.	50
Oral Exam	–	–
Term Work	–	25

## SYLLABUS

- 1. Review**  
D.C. and A.C. circuits.
- 2. Mesh and Node Analysis**  
Mesh and Node Analysis of circuits with independent and dependent sources.
- 3. Linearity, Superposition and Source Transformation**  
Linearity, Superposition, Current and Voltage Source Transformation.
- 4. Network Theorems**  
Thevenin & Norton's Theorem (with independent and dependent sources). Maximum power transfer theorem.
- 5. Circuit Analysis**  
Introduction to Graph Theory, Tree, link currents, branch voltages, cut set and tie set Mesh and Node Analysis, Gauss Elimination Technique, Duality.
- 6. Time and Frequency Response of Circuit**  
First and second order Differential equations, initial conditions, Evaluation and Analysis of Transient Steady state responses using Classical Technique as well as by Laplace Transform (for simple circuits only). Transfer function, Concept of poles and zeros. Frequency response of a system (concepts only), stability criteria and bode plot (concepts only).
- 7. Two-port Networks**  
Concept of two-port network. Driving point and Transfer Functions, Open Circuit impedance (Z) parameters, Short Circuit admittance (Y) parameters, Transmission (ABCD) parameters. Inverse Transmission (A'B'C'D') parameters. Hybrid (h) parameters. Inter Relationship of different parameters. Interconnections of two-port networks. T and Pi representation. Terminated two-port networks.
- 8. Fundamentals of Network Synthesis**  
Positive real functions, Driving Point functions, Brono's Positive real functions, Properties of positive real functions. Testing Positive real functions. Testing driving point functions, Maximum modulus theorem, Properties of Hurwitz polynomials, Residue computations, Even and odd functions, Sturm's theorem. Driving Point Synthesis with L-C, R-C, R-L and R-L-C networks.

### Reference :

1. Circuits and Networks (*Sudhakar & S.P. Shyammohan*) Tata McGraw Hill, 2000 (13<sup>th</sup> Reprint).
2. Engineering Circuits Analysis, (*William H. Hayt, Jack E. Kemmerly & Steven M. Durbin*) McGraw Hill International, 2002 (16<sup>th</sup> Edition).
3. Introduction to Modern Network Synthesis (*M.E. Van Valkenburg*) Wiley Eastern Ltd.
4. Linear Circuit Analysis (*Artice M. Davis*) Thomson Asia Pvt. Ltd., Singapore, 2001 (1<sup>st</sup> Edition).
5. Linear Circuit Analysis (*Raymond A. DeCarlo & Pen-Min Lin*) Oxford University Press, 2001 (2<sup>nd</sup> Ed.)
6. Network Analysis (*M.E. Van Valkenburg*) Prentice Hall of India (3<sup>rd</sup> Edition).

