

25UEET301	NETWORK THEORY	Category	L	T	P	R	Credit	Year of Introduction
		PCC	3	1	0	0	4	2025

Preamble: This course covers circuit analysis techniques for DC and AC circuits under steady-state and dynamic conditions. It also introduces network parameters and transfer functions, forming a fundamental foundation for advanced electrical engineering courses.

Prerequisite: IEE 104 Introduction to Electrical and Electronics Engineering

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Apply circuit theorems to analyze DC and sinusoidal steady state circuits with dependent and independent sources.	K3 Apply
CO2	Apply differential equations and Laplace transform techniques to determine the transient response of RL, RC, and RLC circuits.	K3 Apply
CO3	Apply s-domain analysis to obtain transfer functions and determine poles and zeros of circuits, including coupled circuits and transformers	K3 Apply
CO4	Apply three-phase circuit analysis and two-port network parameters to compute and evaluate circuit performance.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	2	1	1
CO2	3	3	-	2	-	-	-	-	-	-	2	1	2
CO3	3	3	2	2	-	-	-	-	-	-	2	3	2
CO4	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	3	2	2	-	-	-	-	-	-	2	2	2

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	-	-	*	-
CO2	*	*	*	*	-	-	-	*	-
CO3	*	*	*	*	*	-	-	*	-
CO4	*	*	*	*	*	-	-	*	-

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	-	-	*	-

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 Hours

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment	: 15 marks

SYLLABUS

Module 1 (14 Hours)

DC and Sinusoidal steady state analysis of circuits with dependent and independent sources applying Superposition principle, Source transformation, Thevenin's, Norton's and Maximum Power Transfer theorems - Reciprocity theorem.

Module 2 (14 Hours)

Time domain analysis of first and second order dynamic circuits: Formulation of dynamic equations of RL, RC and RLC networks with DC excitation and initial conditions and complete solution using Laplace Transforms - Time constant - Complete solution of RL, RC and RLC circuits with sinusoidal excitation using Laplace Transforms - Damping ratio -Over damped, under damped, critically damped and undamped RLC networks.

Module 3 (13 Hours)

Transformation of impedance and admittance of R, L, and C into s-domain. Mesh and node analysis of circuits in s-domain. Series and parallel resonance.

Dot polarity convention. Sinusoidal steady-state analysis of coupled circuits. Analysis of coupled circuits in s-domain.

Power in three-phase circuits: complex power, active, reactive, and apparent power in balanced loads. Steady-state analysis of unbalanced three-phase circuits: three-wire delta connected circuits, and three-phase four-wire and three-wire star connected circuits (using Millman's theorem only). Concept of neutral shift.

Module 4 (15 Hours)

Introduction to two-port networks and basic concepts. Z, Y, h, and transmission (T/ABCD) parameters. Determination of parameters from circuit analysis.

Relationships between different parameter sets. Symmetrical and reciprocal networks.

Interconnection of two-port networks: series, parallel, and cascade connections. Applications of two-port networks in circuit analysis and communication systems.

Text Books:

1. Ravish R. Singh (2013). *Network analysis and synthesis*. McGraw-Hill Education.
2. Sudhakar A., & Shyam Mohan S. P. (2015). *Circuits and networks: Analysis and synthesis* (5th ed.). McGraw-Hill Education.
3. A. Chakrabarti. (2018). *Circuit theory: Analysis and synthesis* (7th rev. ed.). Dhanpat Rai & Co..

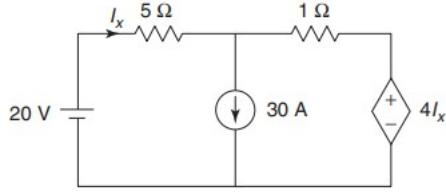
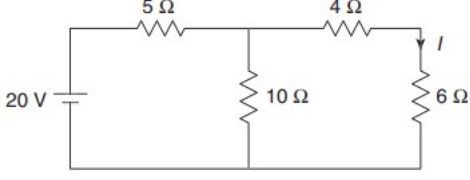
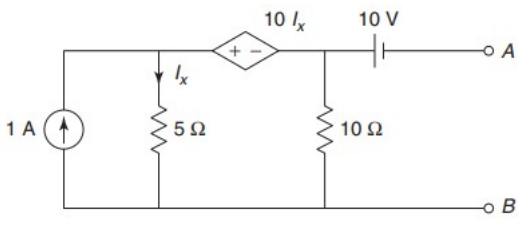
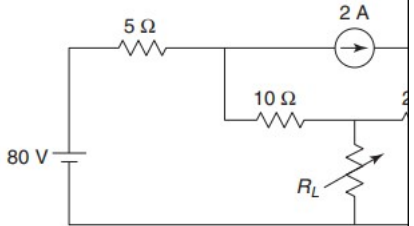
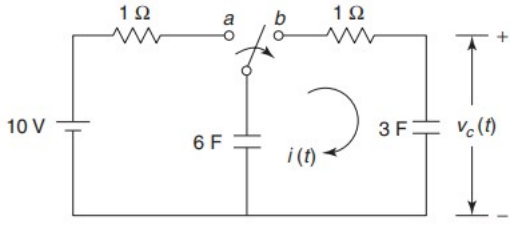
Reference Books:

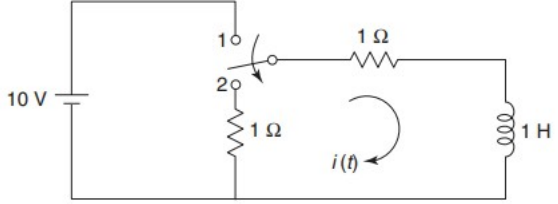
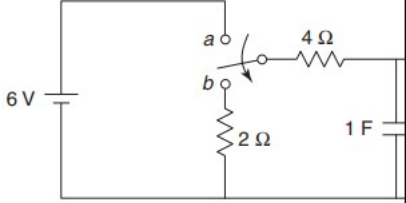
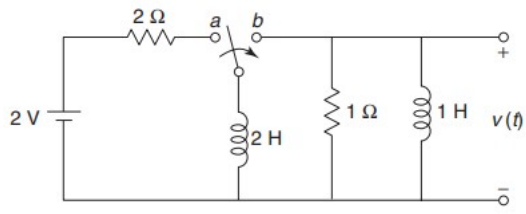
1. M. E. Van Valkenburg. (1980). *Network analysis* (3rd ed.). Prentice Hall India Learning Pvt. Ltd..
2. K. S. Suresh Kumar. (2013). *Electric circuit analysis*. Pearson.
3. John F. Wakerly. (2018). *Digital design: Principles and practices* (5th ed.). Pearson.
4. F. F. Kuo (1966). *Network analysis and synthesis*. John Wiley & Sons.
5. R. Gupta. (2010). *Network analysis and synthesis*. S. Chand & Company Ltd.

**END SEMESTER EXAMINATION – MODEL QUESTION PAPER
(STC 2025 SCHEME)**

Course Code	25UEET301
Course Name	NETWORK THEORY
Max. Marks: 60	Duration: 2.5 Hours

Part A (Answer all questions. Each question carries 3 marks)				
Qn No.	Question	Marks	CO	BL
1	Explain the applicability and limitations of the Superposition theorem.	3	1	L2
2	Interpret the significance of Thevenin's theorem in circuit analysis.	3	1	L2
3	Describe the time constant of RL and RC circuits.	3	2	L2
4	Compare overdamped, underdamped and critically damped RLC circuits with three points	3	2	L2
5	Explain the dot convention used in coupled circuits.	3	3	L2
6	Explain the concept of neutral shift in an unbalanced three-phase star-connected system	3	3	L2
7	Describe the role of transmission parameters in transmission line analysis.	3	4	L2
8	Explain h-parameters and their significance in network analysis.	3	4	L2
Part B (Answer any one full question from each Module. Each carry 9 marks)				
Module I				
Qn No.	Question	Marks	CO	BL
9.a	Compute the current I_x in the figure shown below	5	1	L3

				
9.b	Compute the current I and verify the reciprocity theorem 	4	1	L3
10.a	Determine the Thevenin's equivalent network to the left of A-B in the figure. 	5	1	L3
10.b	Determine the value of load resistance R_L for maximum power transfer and the corresponding maximum power. 	4	1	L3
Module II				
Qn No.	Question	Marks	CO	BL
11.a	In the network of figure shown below, the switch is moved from a to b at $t = 0$. Determine $i(t)$ and $V_c(t)$ 	5	2	L3

11.b	In the network of Figure, the switch is moved from the position 1 to 2 at $t = 0$, steady-state condition having been established in the position 1. Determine $i(t)$ for $t > 0$. 	4	2	L3
OR				
12.a	In the network in the figure, the switch is moved from a to b, at $t = 0$. Calculate $v(t)$. 	5	2	L3
12.b	The network of Fig. 7.15 was initially in the steady state with the switch in the position a. At $t=0$, the switch goes from a to b. Compute an expression for voltage $v(t)$ for $t > 0$ 	4	2	L3
Module III				
Qn No.	Questions	Marks	CO	BL
13. a	A 400V, 50 Hz, 3 phase supply of phase sequence ABC is supplied to a delta connected load consisting of 100Ω resistance between lines A and B, 318mH inductance between lines B and C and $31.8\mu\text{F}$ capacitance between lines C and A. Determine phase and line currents	5	3	L3
13. b	Determine the ratio V_2/V_1 in the circuit if $I_1 = 0$	4	3	L3

OR				
14. a	A three-phase, 400 V RYB system, has a delta-connected load with $Z_{RY} = 10 \angle 90^\circ \Omega$, $Z_{YB} = 20 \angle 45^\circ \Omega$, and $Z_{BR} = 40 \angle -45^\circ \Omega$. Determine the phase currents, line currents and total power. Assume positive phase sequence.	5	3	L3
14. b	Determine the current through the 6Ω resistor in Figure using mesh analysis.	4	3	L3
MODULE 1V				
Qn No.	Questions	Marks	CO	BL
15. a	Compute the Transmission parameters for the network shown below	6	4	L3
15. b	Show that the transmission parameter of two cascaded two-port networks is the product of the transmission parameter matrices of individual two-port networks.	3	4	L3
OR				
16. a	Determine the Y parameters of the network in figure considering as two networks connected in parallel	6	4	L3
16. b	Compute the expression for h parameters in terms of z parameters.	3	4	L3
