Syllabus

CODE	COURSE NAME	CATEGORY	L	T	P	CREDITS
EET281	ELECTRIC CIRCUITS	MINOR	3	1	0	4

Preamble : This course deals with circuit theorems applied to dc and ac electric circuits. Steady and transient state response of electric circuits is discussed. Network analysis is introduced with network parameters and transfer functions. This course serves as the most important prerequisite of all many advanced courses in electrical engineering.

Prerequisite : **Basics of Electrical Engineering / Introduction to Electrical Engineering**

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

CO 1	Apply circuit theorems to simplify and solve DC and AC electric networks.
CO 2	Analyse dynamic DC circuitsand develop the complete response.
CO 3	Analyse coupled circuits in S-domain
CO 4	Analyse three-phase networks in Y and Δ configurations.
CO 5	Develop the representation of two-port networks using Z and Y parameter.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3										2
CO 2	3	3										2
CO 3	3	3										2
CO 4	3	3										2
CO 5	3	3										2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10	10	10
Understand (K2)	20	20	40
Apply (K3)	20	20	50
Analyse (K4)	-	-	-
Evaluate (K5)	-	-	-
Create (K6)	-	-	-

End Semester Examination Pattern : There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. State and explain network theorems (K1)
2. Problems on solving circuits using network theorems. (K2, K3)

Course Outcome 2 (CO2):

1. Distinguish between the natural response and forced response. (K2, K3)
2. Problems on steady state and transient analysis of RL, RC and RLC series circuits with DC excitation and initial conditions. (K2, K3)

Course Outcome 3 (CO3):

1. Problems on mesh analysis,analysis of transformed circuits in s-domain (K2, K3).
2. Problems on nodal analysis,analysis of transformed circuits in s-domain (K2, K3).

Course Outcome 4 (CO4):

1. Problems on analysis of balanced Y and Δ configurations. (K2, K3)
2. Problems on analysis of unbalanced Y and Δ configurations. (K2, K3)

Course Outcome 5 (CO5):

1. Problems on finding Z and Y parameters of simple two port networks. (K2).
2. Derive the expression for Z parameters in terms of Y parameters. (K1).

Model Question paper

QP CODE: PAGES: 3

Reg. No:_____

Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY FIRST SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: EET281
Course Name: ELECTRIC CIRCUITS

Max. Marks: 100 **Duration: 3 Hours**

PART A
Answer all Questions. Each question carries 3 Marks

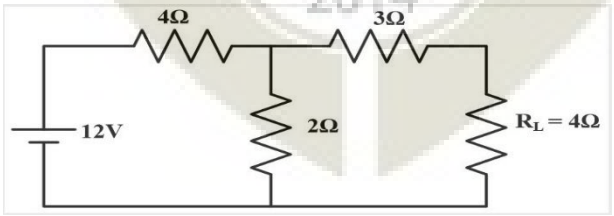
1. Compare the analogy between Nodal and Mesh analysis method.
2. State and explain superposition theorem with suitable examples.
3. Differentiate between transient and steady state analysis.
4. Explain Initial value and final value theorem.
5. Define Self-inductance, Mutual inductance and coupling coefficient.
6. Explain dot rule used in magnetically coupled circuits with the help of a neat figure.
7. Define the terms, real power, reactive power and apparent power.
8. Draw the circuit of a four-wire star connected three phase circuit and mark the lineand phase Voltage.
9. Differentiate driving point and transfer functions with respect to a two port network.
10. Draw the equivalent circuit representation in terms of Z-parameters. **(10 x 3=30)**

PART B

Answer any one full question from each module. Each question carries 14 Marks

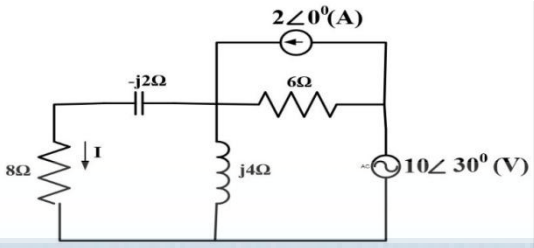
Module-1

11. (a) Draw the Thevenin's equivalent circuit and hence find the power dissipated across R_L **(8)**



(b)Compare the difference between dependent and independent sources. **(6)**

12. (a) Determine the power dissipated across 8Ω for the circuit shown by applying superpositiontheorem. **(10)**



(b) State and explain Thevenin'stheorem with suitable examples. **(4)**

Module-2

13. (a) The current through 5Ω resistor is **I(S) =(5S+3)/(S^2+5S+6).** Find the power dissipated across 5Ω resistor. **(7)**

(b) Derive the equation for the transient current flow through series RL circuit with DCsource and zero initial condition. **(7)**

14. (a) Derive the equation for the transient current flow through series RC circuit with DC source and zero initial condition. **(7)**

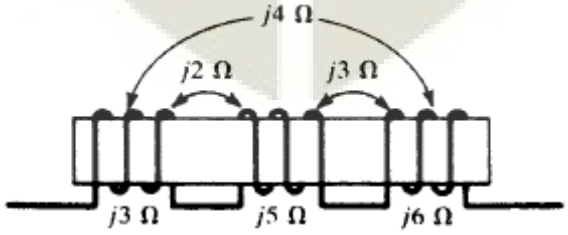
(b) Explain the term time constant with respect to series RL circuit with suitable figures. **(7)**

Module-3

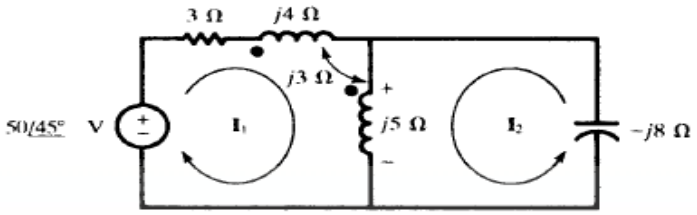
15. (a) In a series aiding connection, two coupled coils have an equivalent inductance LAand in a series opposing connection, the equivalent inductance is LB. Obtain an expression for M in terms of LA and LB. **(7)**

(b) Two coupled coils, L1 = 0.8 H and L2 = 0.2 H, have a coefficient of coupling k = 0:90. Find the mutual inductance M and the turns ratio N1/N2. **(7)**

16. (a) Obtain the dotted equivalent for the circuit shown and use the equivalent to find theequivalent inductive reactance. **(7)**



(b) In the circuit shown in figure, find the voltage across the 5 Ω reactance with the polarity shown. **(7)**



Module-4

17. (a) Explain two watt-meter method to measure the three phase power with the help of suitable equations. **(7)**

(b) Derive the relationship between the line and phase voltage in a three phase starconnected circuit. **(7)**

18. (a) A three-phase, three-wire, balanced, delta-connected load yields wattmeter readings of 154W and 557W. Obtain the load impedance, if the line voltage is 141.4 V. **(7)**

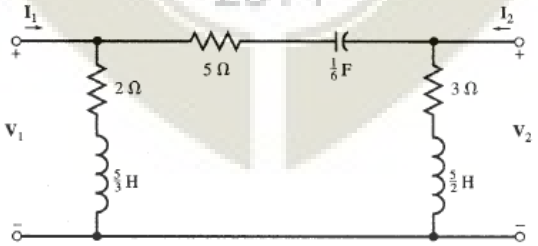
(b) Derive the relationship between the line and phase current of a three phase deltaconnected circuit. **(7)**

Module-5

19. (a) Derive the relationship between Z and Y parameters. **(6)**

(b) Find the Z-parameters of the two-port circuit. **(8)**

20. (a) Find the Y-parameters of the circuit. **(10)**



(b) Explain the condition for symmetry and reciprocity with respect to Z-parameters. **(4)**

Syllabus

Module 1

Circuit theorems: Review of Nodal and Mesh analysis method. DC and ACcircuits analysis with dependent and independent sources applying Network theorems – Superposition theorem, Thevenin's theorem.

Module 2

Steady state and transient response:Review of Laplace Transforms. DCresponseof RL, RC and RLC series circuitswith initial conditions and complete solution using Laplace Transforms- Time constant.

Module 3

Transformed circuits and analysis – Mutual inductance, coupling coefficient, dot rule. Analysis of coupled coils -– mesh analysis and node analysis of transformed circuits in S-domain.

Module 4

Three phase networks: Three phase power in sinusoidal steady state-complex power, apparent power and power triangle. Steady state analysis of three-phase three-wire and four-wire balanced and unbalanced Y circuits, Balanced and unbalanced Delta circuit. Three phase power measurement and two-wattmeter method.

Module 5

Two port networks: Driving point and transfer functions – Z and Y parameters.- Conditions for symmetry & reciprocity – Z and Y parameters. Relationshipbetween Z and Y parameters.

Text Books

1. Joseph A. Edminister and MahmoodNahvi, "Theory and Problems in Electric circuits", McGraw Hill, 5th Edition, 2010.
2. Ravish R. Singh, "Network Analysis and Synthesis", McGraw-Hill Education, 2013

References:

21. Hayt and Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, New Delhi, 8th Ed, 2013.
2. Van Valkenberg, "Network Analysis", Prentice Hall India Learning Pvt. Ltd., 3 edition, 1980.
3. K. S. Suresh Kumar, “Electric Circuit Analysis”, Pearson Publications, 2013.
4. Chakrabarti, "Circuit Theory Analysis and Synthesis", DhanpatRai& Co., Seventh - Revised edition, 2018
5. R. Gupta, "Network Analysis and Synthesis", S. Chand & Company Ltd, 2010.

Course Contents and Lecture Schedule:

No	Topic	No. of Lectures
1	**Circuit theorems(12 hours)**	
1.1	Review of Nodal analysis method.	2
1.2	Review of Mesh analysis method.	2
1.3	Dependent and independent current and voltage sources	2
1.4	Superposition theorem - Application to the analysis of DCand AC circuits with dependent and independent sources.	3
1.5	Thevenin’s theorem - Application to the analysis of DC and AC circuits with dependent and independent sources.	3
2	**Steady state and transient response. (9 hours)**	
2.1	Review of Laplace Transforms – Formulae of Laplace Transforms of common functions/signals, Initial value theorem and final value theorem, Inverse Laplace Transforms – partial fraction method.	3
2.2	DC response of RL series with initial conditions and complete solution using Laplace Transforms- Time constant	2
2.3	DC response of RC series with initial conditions and complete solution using Laplace Transforms- Time constant	2
2.4	DC response of RLC series with initial conditions and complete solution using Laplace Transforms- Time constant	2
3	**Transformed circuits and analysis (8 Hours)**	
3.1	Mutual inductance and Coupling Coefficient	2

3.2	Dot rule and polarity convention	1
3.3	Mesh analysis of transformed circuits in s-domain.	3
3.5	Nodalanalysis of transformed circuits in s-domain.	2
4	**Three phase networks. (9 Hours)**	
4.1	Three phase power in sinusoidal steady state-complex power, apparent power and power triangle.	2
4.2	Steady state analysis of three-phase three-wire and four-wire balanced and unbalanced Y circuits	3
4.3	Steady state analysis of three-phase three-wire and four-wire balanced and unbalanced Delta circuits.	2
4.4	Three phase power measurement and two-wattmeter method.	2
5	**Two port networks (7 Hours)**	
5.1	Two port networks: Terminals and Ports, Driving point and transfer functions.	2
5.2	Z –parameters. Equivalent circuit representation.	1
5.3	Y parameters. Equivalent circuit representation.	1
5.6	Conditions for symmetry & reciprocity- Z and Y-parameters	2
5.7	Relationship between Z and Yparameters.	1