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Code No: AEEB03

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech II Semester End Examinations (Regular), May – 2020

Regulation: IARE-R18

ELECTRICAL CIRCUITS

(COMMON FOR EEE / ECE)

Time:3hours **Max. Marks:70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. a) Classify types of electric circuit elements depending on their characteristics and explain in detail. [7M]

   b) Reduce the network shown in fig (1) 1 below to a single loop network by source transformation, to obtain the current in the 12Ωresistor. [7M]

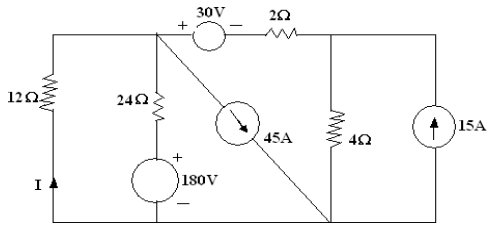


Fig (1)

2. a) Differentiate resistor, inductor and capacitor elements using their voltage-current characteristics. [7M]

   b) The following voltage waveform is applied to an inductor of 2H shown in fig(2).draw the waveform for current through an inductor [7M]

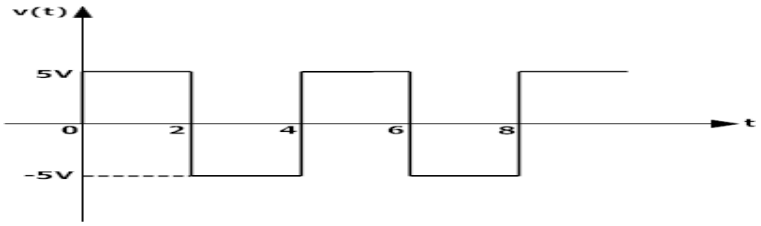
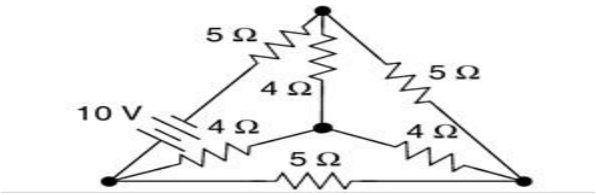


Fig (2)

UNIT – II

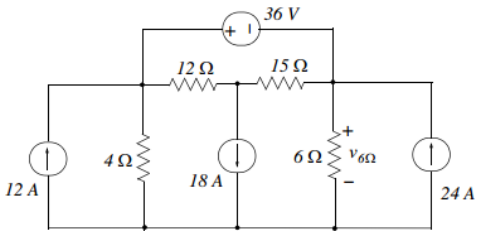
3. a) Summarize the procedure to calculate node voltages of an electrical network with ideal voltage source between any two nodes. [7M]

   b) Write the tie- set matrix for the following network shown in fig (3) below? [7M]



Fig(3)

4. a) Apply nodal analysis and determine the current flowing through each element for the network shown in fig(4) below?. [7M]



Fig(4)

   b) Deduce the incidence , tie-set, cut-set matrices from the graph of network shown in fig(5), also draw the equivalent circuit for the network shown in fig(5) without changing its characteristics. [7M]

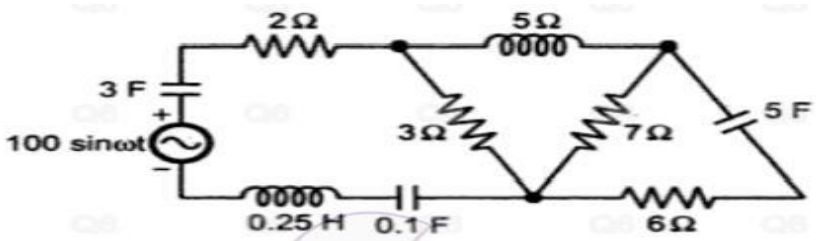


Fig-5

UNIT – III

5. a) Estimate the voltage, current and power in series RLC circuit using sinusoidal excitation. [7M]

   b) Given series RLC Circuit R=10ohms L=1mH c=1μF is connected across sinusoidal source of 20V with variable frequency. Determine resonant frequency, Q factor under resonance and half power frequencies. [7M]

6. a) Find out the Form factor for the fig (6) shown below? [7M]

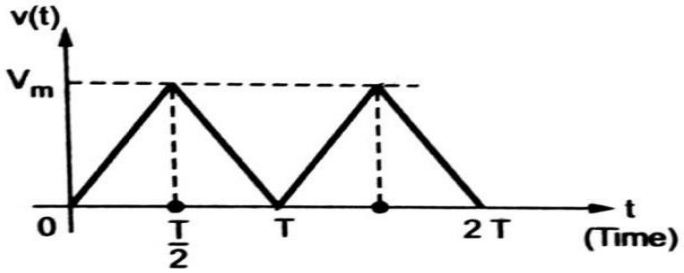


Fig-6

b) Define series resonance. Explain the voltage plots in series RLC circuit with resonance phenomenon and Derive the expression for bandwidth of series RLC circuit. [7M]

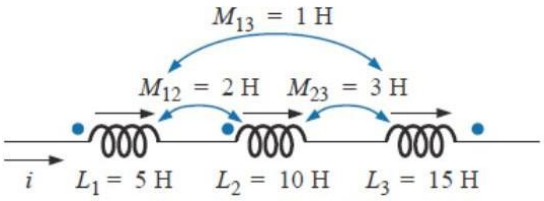
UNIT – IV

7. a) Derive the expression for co-efficient of coupling helps in identifying how strongly two coils are coupled. [7M]

b) An iron ring of mean length 100cm and cross sectional area of 10cm2 has an air gap of 1mm cut in it. it is wound with a coli of 100turns. Assume relative permeability of iron is 500.calculate inductance of coil.. [7M]

8. a) Explain the the procedure to analyze the parallel magnetic circuitwith suitable example? [7M]

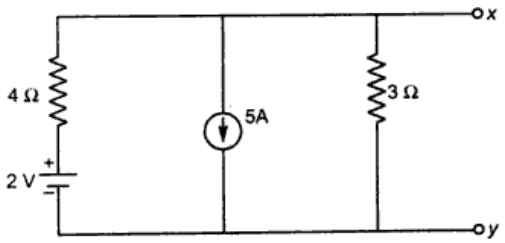
b) Find the total inductance of series coil shown in figure below? [7M]



UNIT – V

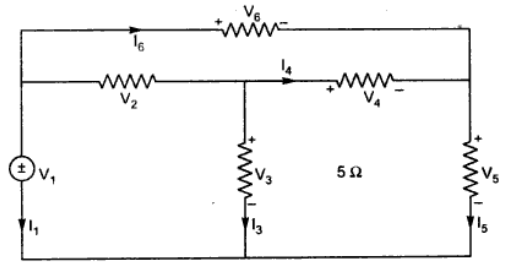
9. a) State and prove Milliman's theorem theorem with an example for DC excitation. [7M]

b) Draw the Norton's equivalent circuit across x-y for the network shown in below. [7M]



10. a) Derive the condition for maximum power transfer with DC excitation and verify with an example. [7M]

b) Verify Tellegen's theorem provide V1 =8V, V2=4V, V4=2V, I1 =4A, I2 = 2A and I3 =1A. [7M]



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COURSE OBJECTIVES:

S. No	Description
I	Classify circuit parameters and apply Kirchhoff‟s laws for network reduction.
II	Apply mesh analysis and nodal analysis to solve electrical networks.
III	Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
IV	Analyze electrical circuits with the help of network theorems.

COURSE OUTCOMES (COs):

CO 1	Understand and analyze basic AC and DC electrical circuits.
CO 2	Apply mesh analysis and nodal analysis to solve electrical networks. Calculate the two port network parameters
CO 3	Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
CO 4	Understand the transient response of series and parallel RL, RC and RLC circuits for DC excitations.
CO 5	Understand the characteristics of complex electrical networks using DC and AC Theorems.

COURSE LEARNINGOUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

S. No	Description
AEEB03.01	Define the various nomenclature used to study the characteristics of DC networks.
AEEB03.02	Understand the concept of circuit, classification of elements and types of energy sources.
AEEB03.03	State different laws associated with electrical circuits and apply source transformation technique to determine equivalent resistance and source current.
AEEB03.04	Apply the network reduction techniques directly.
AEEB03.05	Indirectly to calculate quantities associated with electrical circuit.
AEEB03.06	Define the various nomenclature related with network topology and give the importance of dual network.
AEEB03.07	Identify the alternating quantities with it instantaneous, average and root mean square values.
AEEB03.08	Demonstrate the impression of reactance, susceptance, impedance and admittance in estimating power of AC circuits.
AEEB03.09	Demonstrate the concept of power, real, reactive and complex power, power factor of AC circuits.
AEEB03.10	Design the series and parallel RLC for the required bandwidth, resonant frequency and quality factor.
AEEB03.11	Analyze the steady state behavior of series and parallel RL, RC and RLC circuit with sinusoidal excitation.
AEEB03.12	Determine magnetic flux, reluctance, self and mutual inductance in the single coil and coupled coils magnetic circuits.
AEEB03.13	State the faraday’s laws of electromagnetic induction used in construction of magnetic Circuit.
AEEB03.14	Summarize the procedure of thevenin’s, norton’s and milliman’s theorems to reduce complex network into simple equivalent network.
AEEB03.15	Prove the law of conservation of energy, superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC and AC excitation.

MAPPING OF MODEL QUESTION PAPER QUESTIONS TO THE ACHIEVEMENT OF COURSE LEARNING OUTCOMES

SEE QUESTION No.		COURSE LEARNING OUTCOMES		Course Outcomes	BLOOM TAXONOMY LEVEL
1	a	AEEB03.02	Understand the concept of circuit, classification of elements and types of energy sources.	CO 1	Understand
	b	AEEB03.03	State different laws associated with electrical circuits and apply source transformation technique to determine equivalent resistance and source current.	CO 1	Remember
2	a	AEEB03.01	Define the various nomenclature used to study the DC electrical circuits.	CO 1	Understand
	b	AEEB03.03	State different laws associated with electrical circuits and apply source transformation technique to determine equivalent resistance and source current.	CO 1	Remember
3	a	AEEB03.04	Apply network reduction techniques to calculate unknown quantities associated with electrical circuits.	CO 2	Understand
	b	AEEB03.05	Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electricalcircuits.	CO 2	Understand
4	a	AEEB03.04	Apply network reduction techniques to calculate unknown quantities associated with electrical circuits.	CO 2	Understand
	b	AEEB03.06	Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits.	CO 2	Remember
5	a	AEEB03.07	Analyze the steady state behavior of series and parallel RL, RC and RLC circuits with sinusoidal excitation.	CO 3	Remember
	b	AEEB03.08	Analyze the steady state behavior of series and parallel RL, RC and RLC circuits with sinusoidal excitation.	CO 3	Remember
6	a	AEEB03.07	Analyze the steady state behavior of series and parallel RL, RC and RLC circuits with sinusoidal excitation.	CO 3	Remember
	b	AEEB03.09	Interpret the alternating quantities with its instantaneous, average and root mean square values.	CO 3	Understand
7	a	AEEB03.11	Interpret the alternating quantities with its instantaneous, average and root mean square values.	CO 4	Understand
	b	AEEB03.12	Analyze the steady state behavior of series and parallel RL, RC and RLC circuits with sinusoidal excitation.	CO 4	Understand
8	a	AEEB03.13	Explain the importance of magnetic circuits and their behaviour in electrical engineering.	CO 4	Understand
	b	AEEB03.11	Understand the concept of Phasor diagram for three phase systems and Discuss the active, reactive and apparent power and power factor in three phase circuits.	CO 4	Remember
9	a	AEEB03.14	Summarize the procedure of thevenin's, norton's and milliman's theorems to reduce complex network into simple equivalent network.	CO 5	Understand
	b	AEEB03.15	Prove the law of conservation of energy, superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC and AC excitation.	CO 5	Understand
10	a	AEEB03.14	Summarize the procedure of thevenin's, norton's and milliman's theorems to reduce complex network into simple equivalent network.	CO 5	Understand

	b	**AEEB03.15**	Prove the law of conservation of energy, superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC and AC excitation.	CO 5	Understand

Signature of Course Coordinator **HOD, EEE**