INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech I Semester End Examinations, November – 2019
Regulations: IARE-R18
FUNDAMENTALS OF ELECTRICAL ENGINEERING
(CSE/IT)

Time: 3 hours   **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

MODULE – I

1. a) State ohms law and its limitations and three resistors 50Ω, 20Ω, 30Ω connected in parallel and supplied by 20V source find the currents in all branches and total resistance across source. **[7M]**
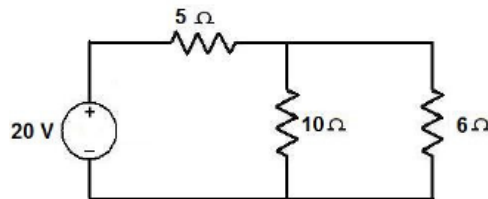   b) Calculate the power consumed by each resistor as shown in Figure 1. **[7M]**

Figure 1

2. a) Three resistors 5Ω, 2Ω, 3Ω connected in parallel and supplied by 20 amps source. Find the currents in all branches and total resistance across source. **[7M]**
    b) Derive current and voltage division rules.

MODULE – II

3. a) Derive delta to star transformation. **[7M]**
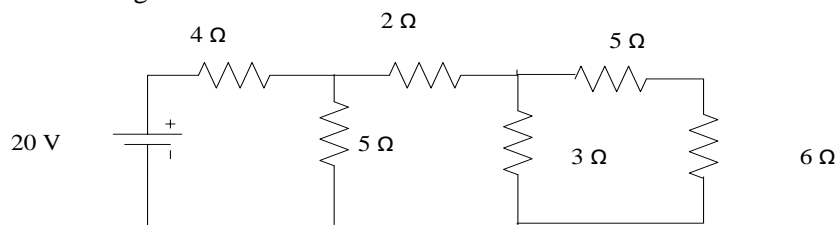   b) Apply nodal analysis and calculate the current above through each element as shown in Figure 2. **[7M]**

Figure 2

4. a) State and verify thevenin's theorem with an example for DC excitation. **[7M]**
    b) In a circuit branch AB=11Ω, BC=20Ω, CD=12Ω, BD=8Ω and DA=15Ω and a source of 100V in series with 5Ω connected across A and C. find the mesh currents. **[7M]**

MODULE – III

5. a) Derive the expression for average and RMS values of sine wave. **[7M]**
    b) Find the following parameters as shown in Figure 3. **[7M]**
        i)   RMS current
        ii)   Average current
        iii) Form factor
        iv)   Peak factor.

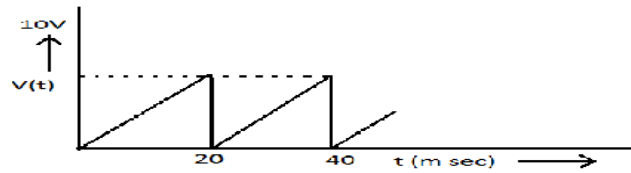Figure 3

6. a) Write the expression for reactance offered by inductor and capacitor. **[7M]**
    b) For a series RL circuit with R=2kΩ and L=30mH. Determine total impedance Z, current I, phase angle voltage across the resistance VR and voltage across the inductor VL. **[7M]**

MODULE – IV

7. a) Explain the concept of active, reactive, apparent power and draw power triangle for pure RL. **[7M]**
    b) In an AC circuit source applied is v=100sin50t across series combination of 16 ohms and 30H, determine total power, phase angle between voltage and current in circuit and power factor of the circuit. **[7M]**

8. a) Predict the voltage, current and power in series RC circuit using sinusoidal excitation. **[7M]**
    b) In an ac circuit two parallel impedances are connected in series with Z1 across AB terminals, where AB terminals are fed by 200V 0degrees. Determine total active power, reactive power and apparent power and power factor of each branch and voltage drop across Z3. **[7M]**
        Z1= (3 + 2j) ohms
        Z2= (4 + 5j) ohms
        Z3= (2 + 4j) ohms.

MODULE – V

9. a) Take any graph and draw all possible trees and basic cut-sets. **[7M]**
    b) Determine the branch voltages using cut-set matrix as shown in Figure 4. **[7M]**
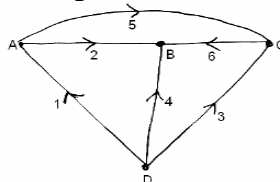

Figure 4

10. a) Explain the duality and dual network with neat example. **[7M]**
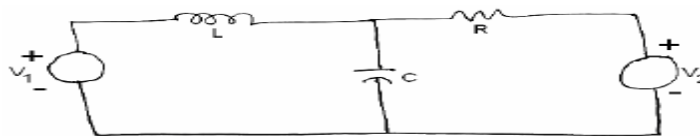   b) Draw the dual network for a given circuit as shown in Figure 5. **[7M]**

Figure 5

COURSE OBJECTIVES:
The course should enable the students to:

I	Understand the basic electrical circuits and circuit laws to study behavior of electrical networks.
II	Use different network reduction techniques to study characteristics of electrical networks.
III	Analyze series and parallel AC circuits using complex notation.
IV	State and use DC circuit theorems to determine unknown currents and voltages.

COURSE OUTCOMES (COs):

CO 1	Understand the basic concepts of electricity, electrical circuits elements, application's of Kirchhoff laws to complex circuits.
CO 2	Explore to the working of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.
CO 3	Summarize various alternating quantities such as instantaneous, peak, RMS, average, form factor and peak factor for different periodic wave forms.
CO 4	Discuss the basic theory of real, reactive, apparent power and complex power, power factor.
CO 5	Explain the concepts of graph, tree, incidence matrix, basic cut set and basic tie set matrices for planar networks, duality and dual networks.

COURSE LEARNING OUTCOMES (CLOs):

AEEB01.01	Define the various nomenclature used to study the DC electrical circuits.
AEEB01.02	Understand the concept of electrical circuit and classify electrical circuit's elements.
AEEB01.03	Analyze the circuits using Kirchhoff's current and Kirchhoff's voltage law.
AEEB01.04	Use of series-parallel concepts for simplifying circuits.
AEEB01.05	Describe source transformation technique to determine equivalent resistance and source current.
AEEB01.06	Apply network reduction techniques to calculate unknown quantities associated with electrical circuits.
AEEB01.07	Summarize the procedure of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.
AEEB01.08	Apply the concept of network theorems.
AEEB01.09	Summarize the procedure of thevenin's and norton's theorems to reduce complex network into simple equivalent network.
AEEB01.10	List out various alternating quantities such as Sinusoidal AC voltage, average and RMS values, form and peak factor, and understand concept of three phase alternating quantity.
AEEB01.11	Interpret the alternating quantities with its instantaneous, average and root mean square values.
AEEB01.12	Illustrate the concept of impedance, reactance, admittance, susceptance and conductance.

AEEB01.13	Understand the phase and phase difference and j notation.
AEEB01.14	Discuss representation of rectangular and polar forms.
AEEB01.15	Analyze the steady state behavior of R, L and C elements with sinusoidal excitation.
AEEB01.16	Analyze the steady state behavior of series and parallel RL and RC circuits with sinusoidal excitation.
AEEB01.17	Analyze the steady state behavior of series and parallel RLC circuits with sinusoidal excitation.
AEEB01.18	Illustrate the concept of real, reactive, apparent power and complex power.
AEEB01.19	Interpret the power factor in single phase AC circuits.
AEEB01.20	Discuss the various nomenclatures related with network topology.
AEEB01.21	Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits.
AEEB01.22	Understand the concepts of duality and importance of dual networks.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No			Course Learning Outcomes	Course Outcomes	Blooms Taxonomy Level
1	a	AEEB01.01	Understand the concept of electrical circuit and classify electrical circuit's elements.	CO 1	Understand
	b	AEEB01.03	Use of series-parallel concepts for simplifying circuits.	CO 1	Understand
2	a	AEEB01.02	Use of series-parallel concepts for simplifying circuits.	CO 1	Understand
	b	AEEB01.04	Analyze the circuits using Kirchhoff's current and Kirchhoff's voltage law.	CO 1	Understand
3	a	AEEB01.08	Describe source transformation technique to determine equivalent resistance and source current.	CO 2	Understand
	b	AEEB01.09	Summarize the procedure of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.	CO 2	Understand
4	a	AEEB01.06	Apply the concept of network theorems.	CO 2	Understand
	b	AEEB01.08	Summarize the procedure of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.	CO 2	Understand
5	a	AEEB01.10	List out various alternating quantities such as Sinusoidal AC voltage, average and RMS values, form and peak factor, and understand concept of three phase alternating quantity.	CO 3	Understand
	b	AEEB01.14	Interpret the alternating quantities with its instantaneous, average and root mean square values.	CO 3	Understand
6	a	AEEB01.10	Illustrate the concept of impedance, reactance, admittance, susceptance and conductance.	CO 3	Understand
	b	AEEB01.12	Illustrate the concept of impedance, reactance, admittance, susceptance and conductance.	CO 3	Understand
7	a	AEEB01.15	Illustrate the concept of real, reactive, apparent power and complex power.	CO 4	Understand
	b	AEEB01.16	Interpret the power factor in single phase AC circuits.	CO 4	Understand
8	a	AEEB01.15	Illustrate the concept of real, reactive, apparent power and complex power.	CO 4	Understand
	b	AEEB01.16	Interpret the power factor in single phase AC circuits.	CO 4	Understand

9	a	AEEB01.20	Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits.	CO 5	Understand
	b	AEEB01.21	Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits.	CO 5	Understand
10	a	AEEB01.20	Understand the concepts of duality and importance of dual networks.	CO 5	Understand
	b	AEEB01.22	Understand the concepts of duality and importance of dual networks.	CO 5	Understand

Signature of Course Coordinator   **HOD, CSE**