A

Question Paper Code: 52B08

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Second Semester

Biomedical Engineering

15UBM208 - ELECTRICAL CIRCUITS ANALYSIS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Six light bulbs are connected in parallel across 110 V. Each bulb is   CO1- R
   related at 75 W. How much current flows through each bulb?

   (a) 0.682A   (b) 0.7 A   (c) 75 A   (d) 110 A

2. Mesh analysis is based on   CO1- R

   (a) Kirchhoff's current law   (b) Kirchhoff's voltage law   (c) Source   (d) Load

3. Superposition theorem is valid only for   CO2- R

   (a) Linear circuits   (b) Non-linear circuits

   (c) Both linear and non-linear   (d) Neither of the two

4. Maximum power is transferred when load impedance is   CO2- R

   (a) Equal to source impedance   (b) Equal to half of the source impedance

   (c) Equal to zero   (d) None of the above

5. What is the total reactance of a series RLC circuit at resonance?   CO3- R

   (a) Equal to X_L (b) Equal to X_C (c) Equal to R   (d) Zero

6. Mutual inductance is a property associated with   CO3- R

   (a) Only one coil   (b) Two or more coils

   (c) Two or more coils with magnetic coupling   (d) None of the above

7. The transient response occurs   CO4- R

   (a) Only in resistive circuits   (b) Only in inductive circuits

   (c) Only in capacitive circuits   (d) Both in (b) and (c)

8. The time constant of a series RL circuit is   CO4- R

   (a) LR   (b) L/R   (c) R/L   (d) 0

9. The resultant voltage in a closed balanced delta circuit is given by   CO5- R

   (a) Three times the phase voltage   (b) $\sqrt{3}$ times the phase voltage

   (c) Zero   (d) one

10. In a three-phase system, the volt-ampere rating is given by   CO5- R

    (a) $3 V_L I_L$ (b) $\sqrt{3} \ V_L I_L$ (c) $V_L I_L$ (d) P_L

<center>PART – B (5 x 2= 10 Marks)</center>

11. State the Ohm's law and give their limitations.   CO1- R

12. In a circuit contains V=50 volts, R_{th} =25 Ω.Determine the value of load   CO2- R
    resistance when the load resistance draws maximum powers also find the value
    of P_{Max}

13. Define the dot rule for coupled circuits.   CO3- R

14. What is meant by forces and free response?   CO4- R

15. Distinguish between the balanced and unbalanced star connection load.   CO5- R

<center>PART – C (5 x 16= 80 Marks)</center>

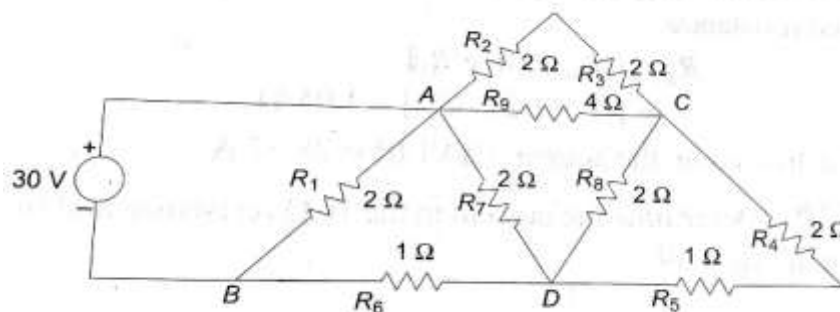16. (a) Determine the current delivered by the source in the circuit shown   CO1 App   (16)
         in Figure 1.

<center>Figure 1</center>

<center>Or</center>

<center>2</center>

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(b) Determine the mesh current I_1, I_2, and I_3 in the circuit shown in Figure 2.   CO1 App   (16)
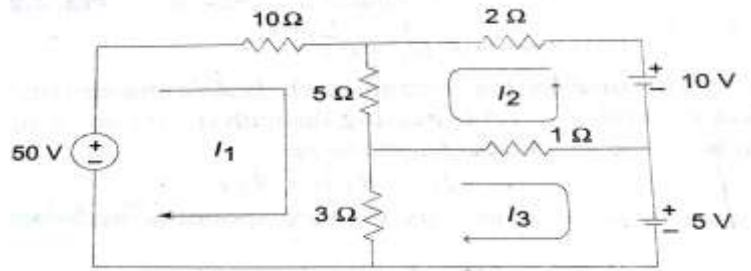

Figure 2

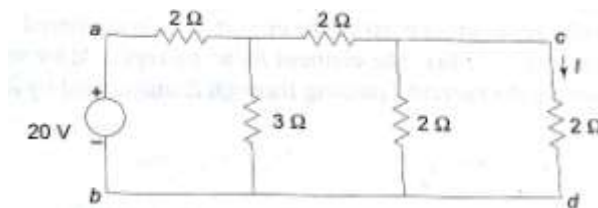17. (a) Verify the reciprocity theorem for the network shown in Figure 3   CO2- App   (16)

Figure 3

Or

(b) Determine the current flowing through the 5Ω resistor in the circuit shown in Figure 4 by using Norton's theorem.   CO2- App   (16)
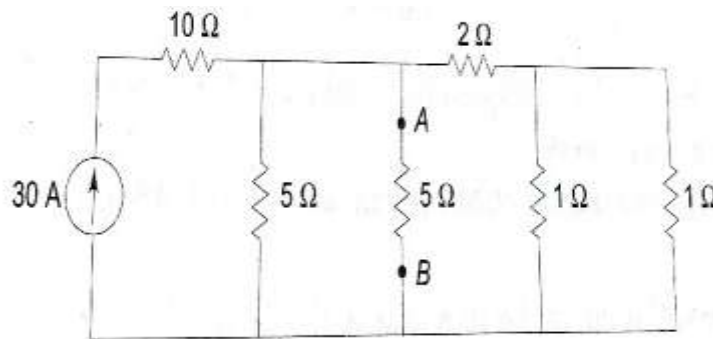

Figure 4

18. (a) (i)Two coupled coils of inductance $L_1 = 0.5$ H and $L_2 = 8$ H and K = 0.5 are connected in,   CO3- Ana   (8)
(a) Series aiding mode
(b) Series opposing mode
(c) Parallel aiding mode
(d) Parallel opposing mode
Calculate equivalent inductance of each case

(ii) Derive the resonant frequency of a series RLC circuit.   CO3- Ana   (8)

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Or

(b) Determine the half power frequencies Bandwidth, the quality factor of a coil for the series circuit consisting of R=10 Ω, L= 0.1 H and C= 10μF. CO3- Ana (16)

19. (a) Derive and determine the DC response of an RL Series circuit and also find the voltage across the resistance and Inductance of the DC response. CO4- U (16)

Or

(b) In an RLC series circuit contains R= 20Ω, L= 0.05 H, and C= 20μF with the 100 V source when the switch is closed at t=0. Find the transient current. CO4- U (16)

20. (a) A three-phase balanced delta–connected load of (4+j8)Ω is connected across a 400 V,3phase balanced supply.Determine the phase currents and line currents.Assume the phase sequence to be RYB.Also, calculate the power drawn by the load. CO5- U (16)

Or

(b) A400V, three –phase supply feeds an unbalanced three-wire,star connected load. The Branch Impedances of The Load are
Z_R = (4+j8)Ω, Z_y = (3+j4)Ω and Z_B = (15+j20)Ω. Find the line currents and voltage across each phase impedance. Assume the RYB phase sequence. CO5- U (16)

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