Reg. No. :

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Third Semester

Electronicsand Communication Engineering

14UEC303 - CIRCUIT THEORY

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The number of independent loops for a network with n nodes and b branches is

    (a) n-1   (b) b-n
    (c) b-n+1   (d)independent for the number of nodes

2. Ohm's law is given by

    (a) $V = ZI$ (b) $I = GV$ (c) both (a) and (b)   (d) none of these

3. Superposition theorem is not applicable to networks containing

    (a) nonlinear elements   (b) dependent voltage source
    (c) dependent current source   (d)transformers

4. Maximum power gets transferred to the load when the load impedance is

    (a) equal to zero   (b) equal to one
    (c) equal to source impedance   (d) none of the above

5. What is the Q (Quality factor) of a series circuit that resonates at 6 *kHz*, has equal reactance of 4 *kilo-ohms* each, and a resistor value of 50 *ohms*?

    (a) 0.001   (b) 50   (c) 80   (d) 4.0

6. The Q-factor in a series R-LC circuit at resonance is

    (a) $\dfrac{1}{R}\sqrt{\dfrac{C}{L}}$ (b) $\dfrac{1}{L}\sqrt{\dfrac{C}{R}}$ (c) $\dfrac{1}{R}\sqrt{\dfrac{L}{C}}$ (d) $\dfrac{1}{R^2}\sqrt{\dfrac{C}{L}}$

7. Self-inductance of a magnetic coil is proportional to

    (a) N (b) $1/N$ (c) N^2 (d) $1/N^2$

8. In two wattmeter method of power measurement, when the power factor of load is zero leading or lagging the two wattmeter will give_____ reading.

    (a) Zero   (b) equal
    (c) equal and opposite   (d) not equal

9. A two - port network is symmetrical if

    (a) $Z_{11}Z_{22} - Z_{12}Z_{21} = 1$ (b) $AD - BC = 1$
    (c) $h_{11}h_{22} - h_{12}Z_{21} = 1$ (d) $Y_{11}Y_{22} - Y_{12}Y_{21} = 1$

10. For a two port network to be reciprocal

    (a) $Z_{11}=Z_{22}$ (b) $y_{21}=y_{22}$ (c) $h_{21}= -h_{12}$ (d) $AD-BC=0$

<div align="center">PART - B (5 x 2 = 10 Marks)</div>

11. State Kirchhoff's laws for electric circuits.

12. Write the expression for Millman's equivalent source of n number of parallel connected voltage sources.

13. Give the expressions for series and parallel resonance frequency.

14. Write the symmetrical components of three phase system.

15. Write the expression of Y parameters in terms of ABCD parameters.

<div align="center">PART - C (5 x 16 = 80 Marks)</div>

16. (a) Find V_{BD} by nodal analysis for the circuit shown in the figure.   (16)

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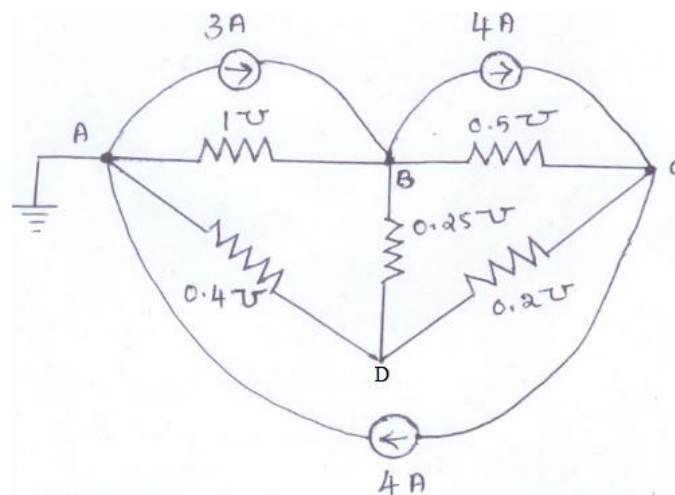
Or

(b) Find the equivalent resistance between the terminals *A* and *B* for the circuit shown in Figure 3. (16)
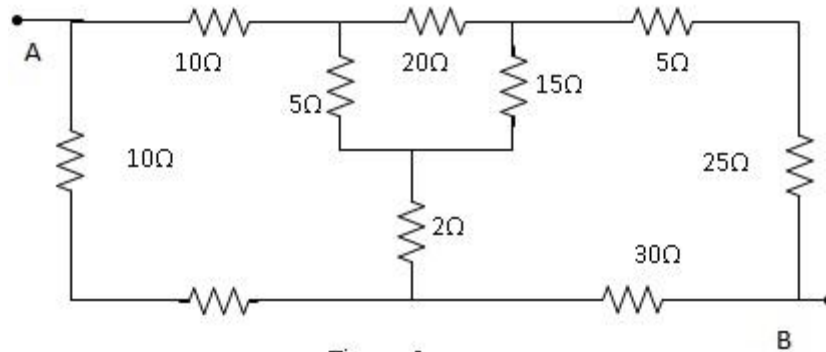

Figure 3

17. (a) Determine the current in the 10-Ω resistor for the circuit shown in Figure 4 by using superposition theorem. (16)
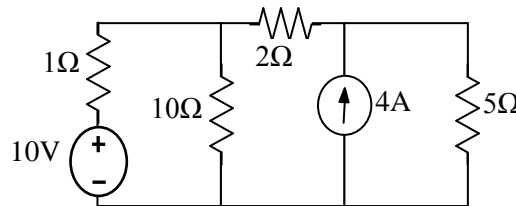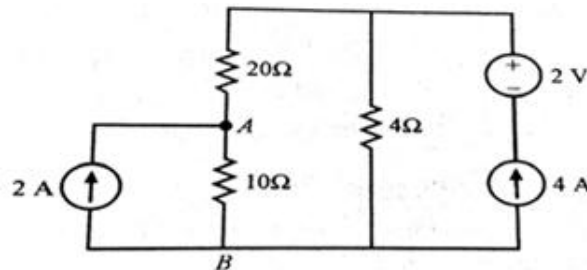

Figure 4

Or

(b) Determine V_{AB} using superposition theorem in the circuit shown in figure. (16)

18. (a) A RLC series circuit consists of $R = 16\ \Omega$, $L = 5\ mH$ and $C = 2\ \mu F$. Calculate the quality factor, bandwidth and half-power frequencies. (16)

Or

41433

(b) Obtain the resonant frequency, Q-factor, band width and the voltage across the capacitor at resonance for the series RLC circuit having $R = 7.5\Omega$, $L = 6\mu H$ and $C = 40pF$, with a supply voltage of 0.5 *volts*. (16)

19. (a) Two coils connected in series have an equivalent inductance of 0.8 *H* when connected in aiding and an equivalent inductance of 0.4 *H* when connected in opposing. Determine the mutual inductance. Calculate the self-inductance of the coils, by taking $k = 0.55$. (16)

Or

(b) Three pure resistances value 200 Ω each are connected to a 3 phase, 440 *V, 50 Hz* supply. Determine the line, phase values of current, voltage and active power in both star and delta connections. (16)

20. (a) The current I_1 and I_2 at the input port and output port respectively of a two port network are given by

$I_1 = 6V_1 - V_2$ and $I_2 = -V_1 + 2\,V_2$

Find the equivalent pie-network and the input impedance when a load of *(4+j7)* Ω is connected across the output port. (16)

Or

(b) Design a low pass filter having cut – off frequency of 2 *KHz*, to operate with a terminal load resistance of 500Ω . (16)

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