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Question Paper Code: 41343

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Electronics and 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. The nodal methods of circuit analysis is based on

   (a) KVL and Ohm's law (b) KCL and Ohm's law
   (c) KCL and KVL (d) KCL, KVL and Ohm's law

3. Superposition theorem is not applicable to networks containing

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

4. The maximum power that can be transferred to the load R_L from the voltage source in Fig. 1 is

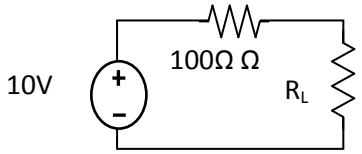

Figure 1

   (a) 1 W (b) 10 W (c) 0.25 W (d) 0.5 W

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 step function voltage is applied to an RLC series circuit having $R = 2$ *ohm*, $L = 1$ *H* and $C = 1$. The transient current response of the circuit would be

(a) over damped (b) critically damped
(c) under damped (d) none of the above

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

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

8. A 3 phase load is balanced if all the three phases have the same

(a) impedance (b) power factor
(c) impedance and power factor (d) none of the above

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) $Z_{11} = Z_2$ (b) $y_{21} = y_{12}$ (c) $h_{21} = -h_{12}$ (d) $AD-BC = 0$

PART - B (5 x 2 = 10 Marks)

11. A 10 *A* current source has a source resistance of 100 *ohm*. What will be the equivalent voltage source?

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

13. A RC series circuit is excited by a dc voltage source of 80 *V* by closing the switch at $t = 0$. Determine the voltage across the capacitor in a time of one time constant.

14. Write the symmetrical components of three phase system.

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

PART - C (5 x 16 = 80 Marks)

16. (a) Find the current in the 5 *ohm* resistor of the circuit shown in Figure 2 by using mesh analysis. (16)

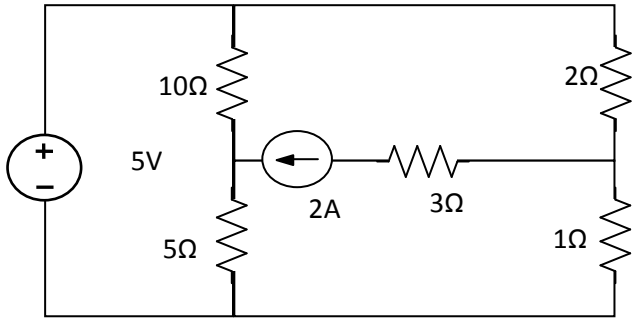

Figure 2

Or

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

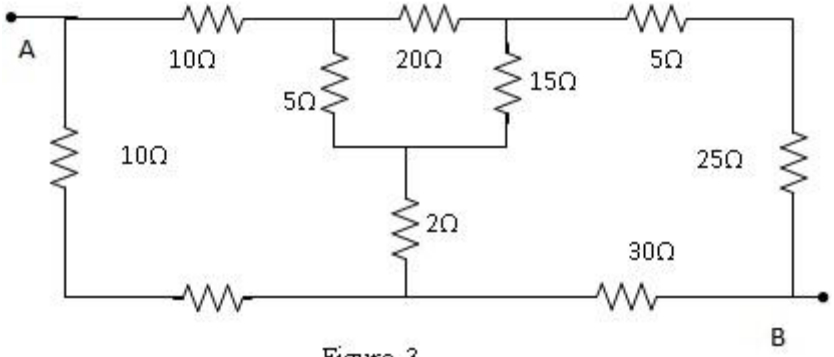

Figure 3

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

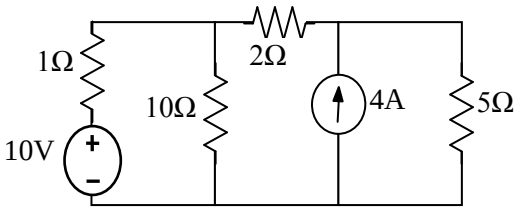

Figure 4

Or

(b) In the circuit of figure 5, determine the impedance that can be connected across the terminals *A* and *B* for the maximum power. Also estimate the maximum power. (16)

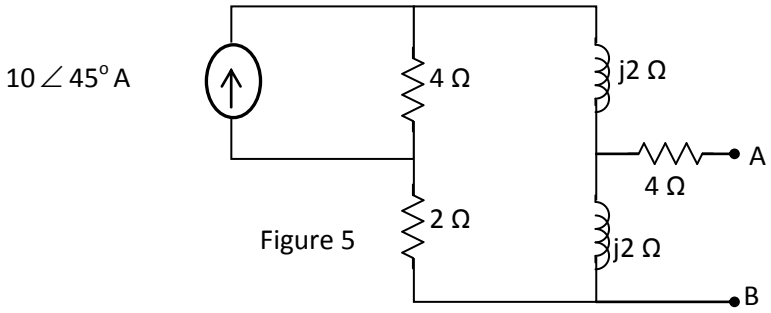

Figure 5

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

Or

(b) A capacitor has an initial charge of Q_o. A resistance R is connected across the capacitor at t = 0, to discharge the charge. The power transient of the capacitor $Pc(t) = 800e^{-4000t}$ W. Find the value of R and Q_0. Take C = 10 μF. (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 coils each having a resistance of 20 Ω and a reactance of 15 Ω are connected in (i) star and (ii) delta, across a three-phase, 400 V, 50 Hz supply. Calculate in each case, the readings on two Watt meters connected to measure the power input. (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) Currents I_1 and I_2 entering at port 1 and port 2 respectively of a two-port network are given below by the following equations:

$I_1 = 0.5\ V_1 - 0.2\ V_2$

$I_2 = -0.2\ V_1 + V_2$

Find the Z and ABCD parameters for the network. (16)