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06ES34

Third Semester B.E. Degree Examination, Dec.2013/Jan.2014
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Using star-delta transformation reduce the given network shown in Fig.Q1(a) and determine the total current supplied by the source. **(04 Marks)**

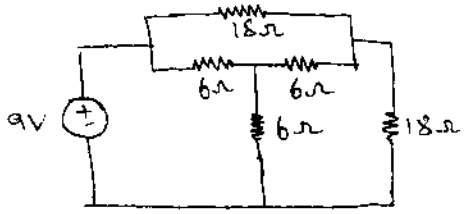

Fig.Q1(a)

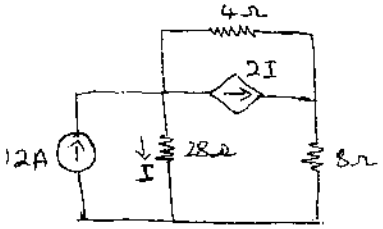

Fig.Q1(b)

b. Use mesh analysis to calculate the current I in the circuit shown in Fig.Q1(b). **(10 Marks)**

c. Find the node voltages in the network shown in Fig.Q1(c) **(06 Marks)**

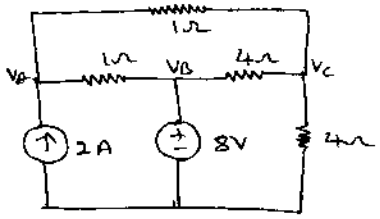

Fig.Q1(c)

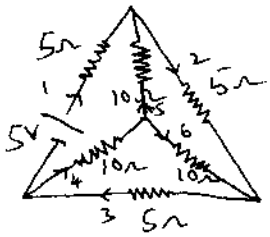

Fig.Q2(b)

2 a. Explain the following terms with example as applied to network topology: (i) Oriented graph (ii) Planar and non-planar graph (iii) Tree (iv) Tie-set (v) Cut-set. **(10 Marks)**

b. Write the oriented graph for the circuit shown in Fig.Q2(b), taking branches 4, 5, 6 as tree obtain tie-set schedule and using this tie-set schedule obtain equilibrium connection on loop current basis. **(10 Marks)**

3 a. State and prove reciprocity theorem. **(05 Marks)**

b. Find the current through 2Ω resistor in the network shown in Fig.Q3(b), using super position theorem. **(08 Marks)**

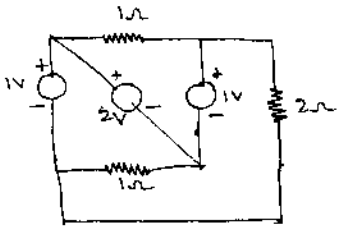

Fig.Q3(b)

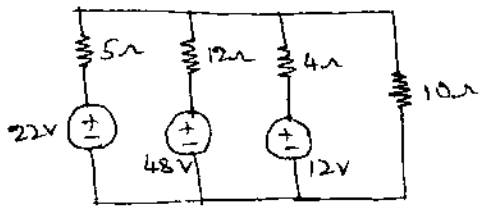

Fig.Q3(c)

c. Using Millnoon's theorem find the current through 10Ω resistor in the network shown in Fig.Q3(c). **(07 Marks)**

4 a. State and prove maximum power transfer theorem for DC circuit. **(06 Marks)**

b. Determine the Norton's equivalent circuit across terminals ab in the network shown in Fig.Q4(b). **(06 Marks)**

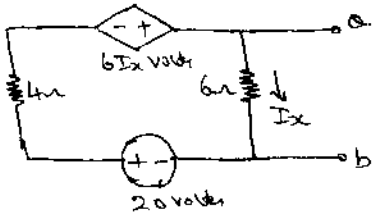

Fig.Q4(b)

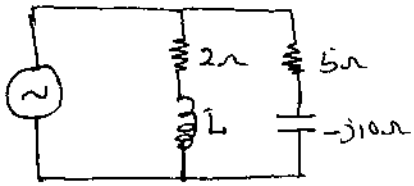

Fig.Q5(c)

c. A linear time invariant network when terminated with (i) R = 1Ω the current is $5\angle -45^\circ$ A (ii) X_c = 1 Ω, the current is $10\angle -45^\circ$ A. Find the Thevenin's equivalent of the network. What will be the current if it is terminated with X_L = 1 Ω. **(08 Marks)**

PART – B

5 a. Show that in a series resonant circuit the resonant frequency is the geometric mean of half-power frequencies. **(06 Marks)**

b. A series resonant circuit includes 1 μF capacitor and a resistance of 16Ω, if the bandwidth is 500 rad/sec. Determine (i) W_r (ii) Q (iii) L. **(06 Marks)**

c. Find the value of L for which the circuit shown in Fig.Q5(c) is resonate at a frequency of W = 500 rad/sec. **(08 Marks)**

6 a. Explain the behavior of circuit elements Resistor, Inductor and Capacitor during switching conditions. **(06 Marks)**

b. In the circuit shown in Fig.Q6(b), the switch is closed at t=0. Find i_L, i_c, $\frac{di_L}{dt}$ and $\frac{di_c}{dt}$ at $t = 0^+$. **(08 Marks)**

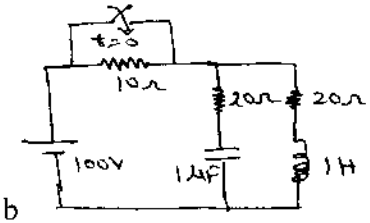

Fig.Q6(b

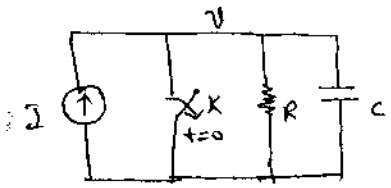

Fig.Q6(c)

c. In the network shown in Fig.Q6(c), switch 'K' is opened at t = 0. Solve for v. $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$, if I = 10 A, R = 1000 Ω, C = 1 μF. **(06 Marks)**

7 a. State and prove initial value theorem and final value theorem. **(08 Marks)**

b. Find the Laplace transform of the waveform shown in Fig.Q7(b). **(06 Marks)**

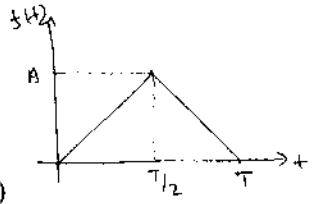

Fig.Q7(b)

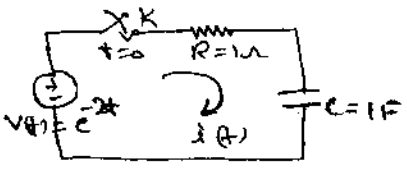

Fig.Q7(c)

c. Find i(t) for t > 0 in the network shown in Fig.Q7(c) using Laplace transformation. Assume $V_c(0^-)$ = 0 V. **(06 Marks)**

8 a. Derive expression for Z-parameters in terms of Y parameters. **(08 Marks)**

b. Obtain ABCD parameters in terms of impedance [Z] parameters and hence show that AD – BC = 1 **(08 Marks)**

c. For a certain two port network V_1 and V_2 are given by $V_1 = 60I_1 + 20I_2$, $V_2 = 20I_1 + 40I_2$

Find Y – parameters of the network. **(04 Marks)**

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