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10ES34

Third Semester B.E. Degree Examination, December 2012

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. Define and distinguish the following network elements:
i) Linear and non-linear ii) Active and passive
iii) Lumped and distributed iv) Ideal and practical current sources **(08 Marks)**

b. Write the mesh equation for the circuit shown in Fig.Q1(b) and determine mesh currents using mesh account analysis. **(06 Marks)**

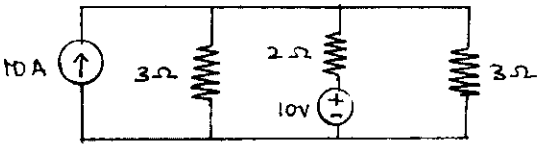

Fig.Q1(b)

c. Reduce the network shown in Fig.Q1(c) to a single voltage source in series with a resistance using source shift and source transformations. **(06 Marks)**

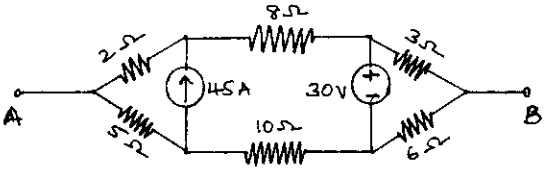

Fig.Q1(c)

2 a. Define the following terms with reference to network topology. Give examples.
i) Tree ii) Graph iii) Sub-graph iv) Tie-set v) Cut-set **(10 Marks)**

b. Construct a tree for the network shown in Fig.Q2(b) so that all loop currents pass through 7Ω. Write the corresponding the set matrix. **(06 Marks)**

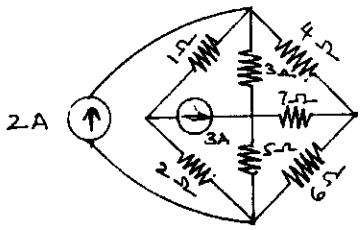

Fig.Q2(b)

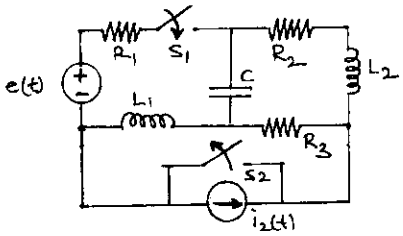

Fig.Q2(c)

c. What are dual networks? Draw the dual of the circuit shown in Fig.Q2(c). **(04 Marks)**

3 a. Using superposition theorem, obtain the response I for the network shown in Fig.Q3(a).

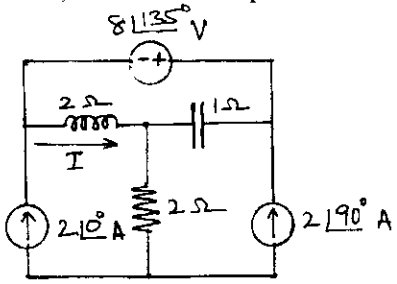

Fig.Q3(a) **(08 Marks)**

3 b. Verify reciprocity theorem for the circuit shown in Fig.Q3(b). **(06 Marks)**

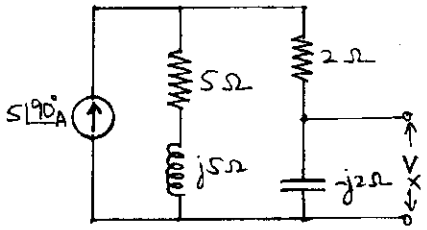

Fig.Q3(b)

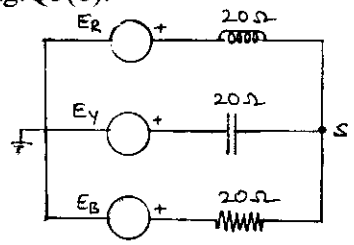

Fig.Q3(c)

c. Use Millman's theore to determine the voltage VS of the network shown in Fig.Q3(c), given that $E_R = 230\angle 0$ V ; $E_Y = 230\angle -120°$ V and $E_B = 230\angle 120°$ V. **(06 Marks)**

4 a. For the network shown in Fig.Q4(a), obtain the Thevenin's equivalent as seen from the terminals p and q. **(08 Marks)**

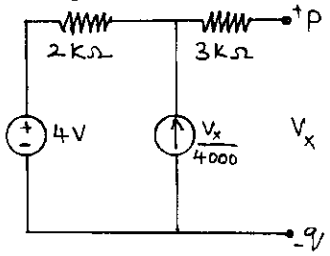

Fig.Q4(a)

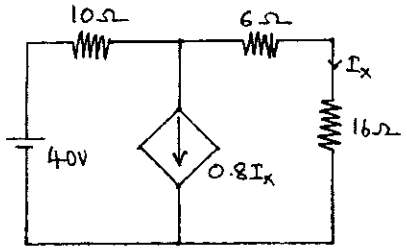

Fig.Q4(b)

b. State Norton's theorem and find the current through 16Ω resistor using Norton's theorem in Fig.Q4(b). **(06 Marks)**

c. For the network shown in Fig.Q4(c), determine the impedance Z_X such that maximum power is transferred from the source to the load of impedance Z_X.

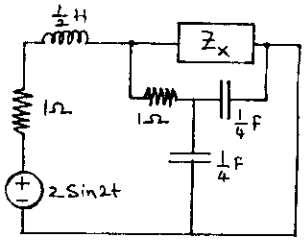

Fig.Q4(c) **(06 Marks)**

PART – B

5 a. Define the following terms with reference to resonant circuit:
i) Resonance ii) Q-factor iii) Selectivity iv) Bandwidth **(06 Marks)**

b. A series RLC circuit has R = 10Ω, L = 0.01H and C = 0.01μF and it is connected across 10 mV supply. Calculate: i) f_o ; ii) Q_o ; iii) Bandwidth ; iv) f_1 and f_2 ; v) I_o **(10 Marks)**

c. Determine R_L and R_C for which the circuit shown in Fig.Q5(c) resonates at all frequencies.

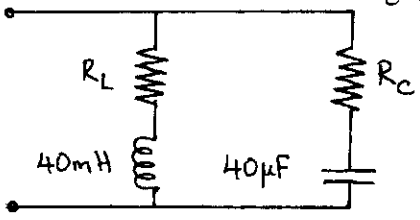

Fig.Q5(c) **(04 Marks)**

6 a. Explain the transient behaviour of resistance, inductance and capacitance. Also explain the procedure for evaluating transient behaviour. **(10 Marks)**

6 b. In the network shown in Fig.Q6(b), 'K' is changed from position 'a' to 'b' at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$, if R = 1000 Ω, L = 1H and C = 0.1μF and V = 100V. Assume that the capacitor is initially uncharged. **(10 Marks)**

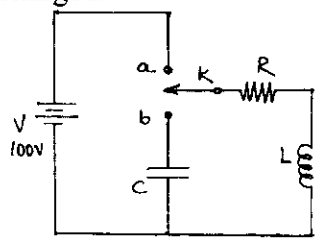

Fig.Q6(b)

7 a. Assuming that the staircase waveform of Fig.Q7(a) is not repeated, find its Laplace transform. If this voltage wave is applied to a RL series circuit with R = 1Ω and L = 1H, find the current i(t). **(10 Marks)**

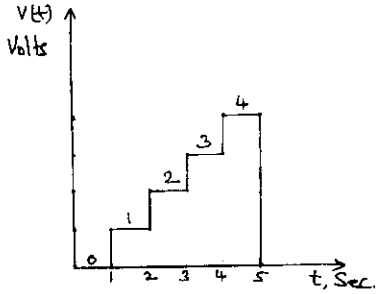

Fig.Q7(a)

b. The network shown in Fig.Q7(b) was in steady state before t = 0. The switch is opened at t = 0. Find i(t) for t > 0, using Laplace transform. **(10 Marks)**

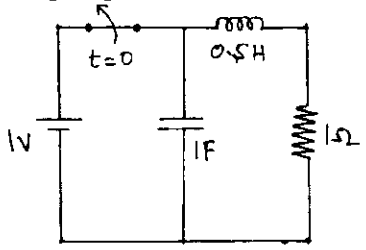

Fig.Q7(b)

8 a. Obtain the h-parameters for the network shown in Fig.Q8(a). **(10 Marks)**

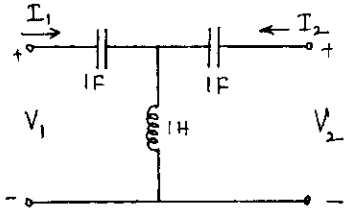

Fig.Q8(a)

b. Obtain ABCD parameters in terms of z-parameters and hence show that AD – BC = 1. **(10 Marks)**

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