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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)**

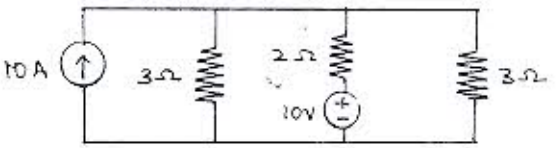

Fig.Q1(b)

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)**

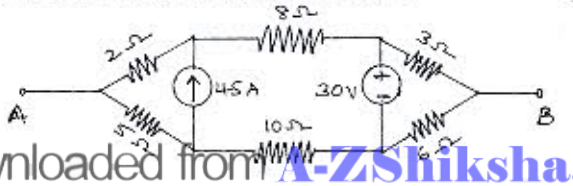

Fig.Q1(c)

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)**

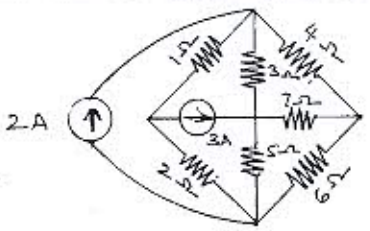

Fig.Q2(b)

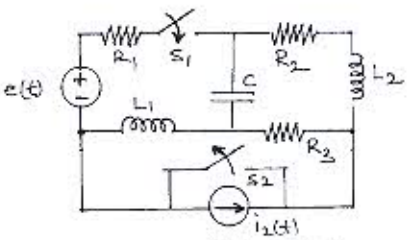

Fig.Q2(c)

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).

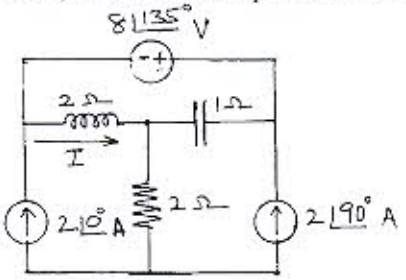

Fig.Q3(a)

(08 Marks)

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

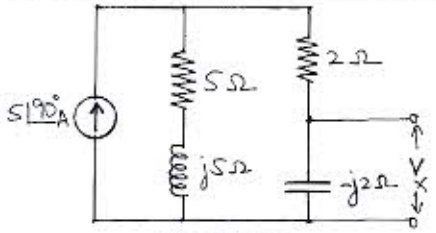

Fig.Q3(b)

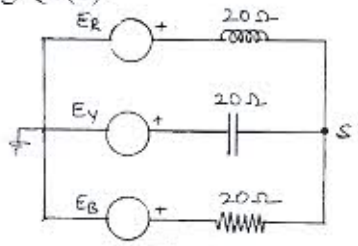

Fig.Q3(c)

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)**

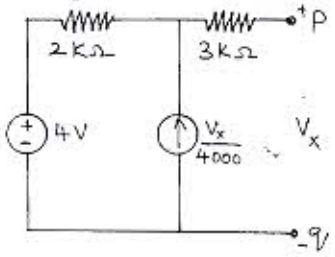

Fig.Q4(a)

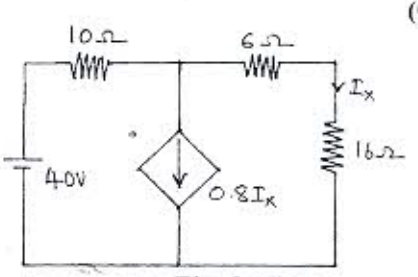

Fig.Q4(b)

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.

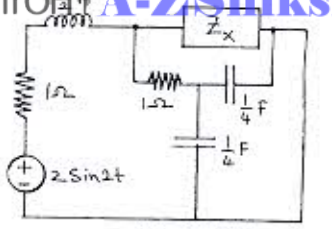

Fig.Q4(c)

(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.

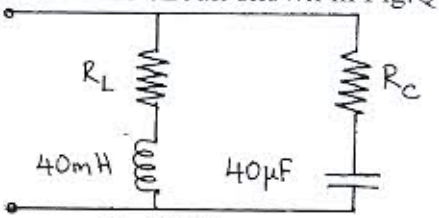

Fig.Q5(c)

(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)**

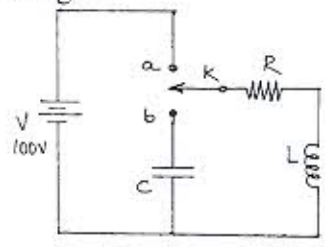

Fig.Q6(b)

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)**

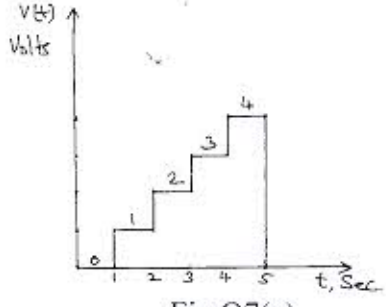

Fig.Q7(a)

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)**

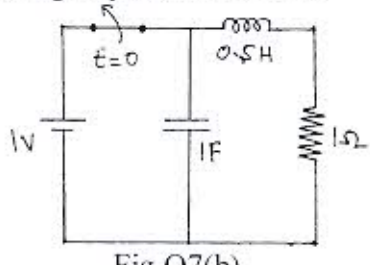

Fig.Q7(b)

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

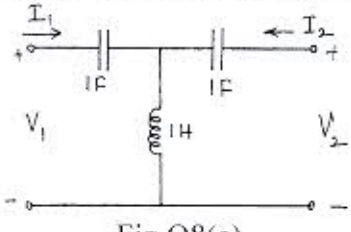

Fig.Q8(a)

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

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

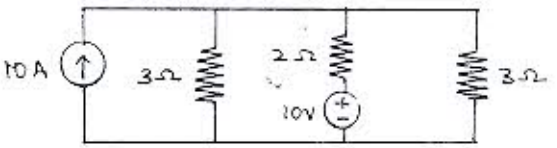


Fig.Q1(b)

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)**

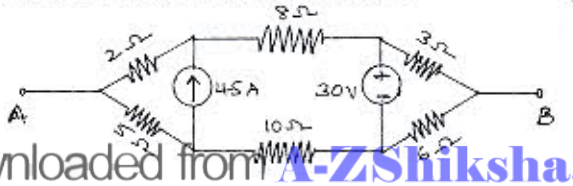


Fig.Q1(c)

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)**

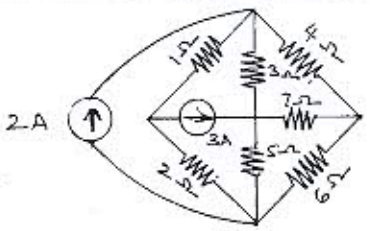
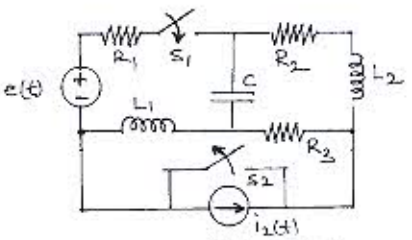


Fig.Q2(b)



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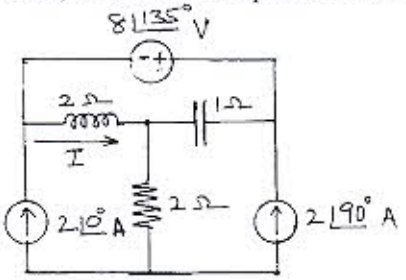

Fig.Q3(a)

(08 Marks)

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

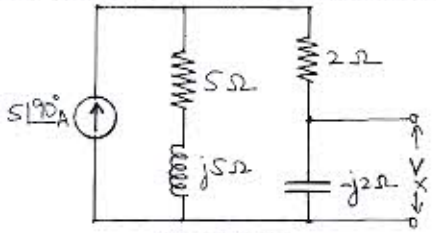

Fig.Q3(b)

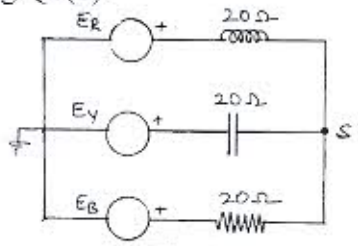

Fig.Q3(c)

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)**

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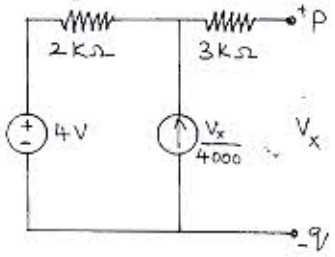

Fig.Q4(a)

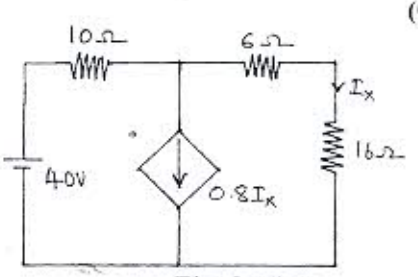

Fig.Q4(b)

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

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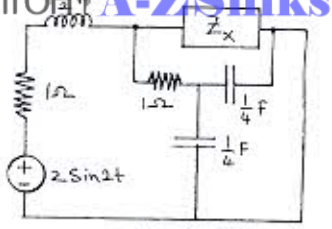

Fig.Q4(c)

(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.

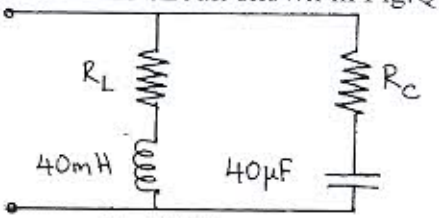

Fig.Q5(c)

(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)**

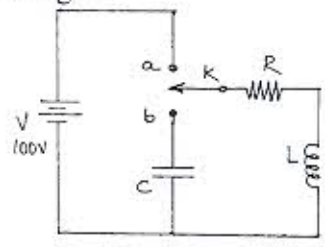

Fig.Q6(b)

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)**

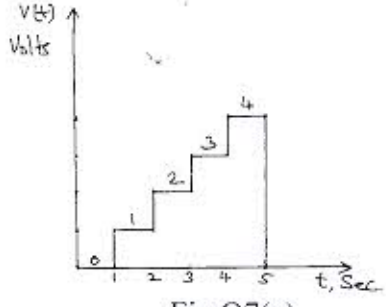

Fig.Q7(a)

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)**

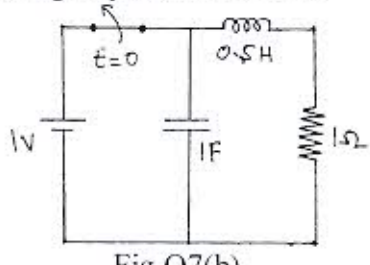

Fig.Q7(b)

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

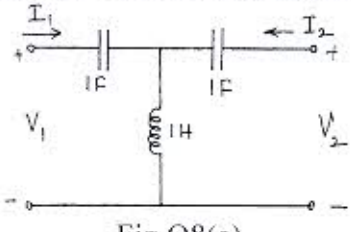

Fig.Q8(a)

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

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10ES34

Third Semester B.E. Degree Examination, June 2012
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may suitably be assumed.

PART – A

1 a. Find the equivalent resistance at AB using Y - Δ transformation technique in Fig. Q1(a). **(05 Marks)**

b. Find the current I in 28 Ω resistor by Mesh analysis in Fig. Q1(b). **(05 Marks)**

c. Find the power dissipated in 10 Ω resistor by node voltage method in Fig. Q1(c). **(10 Marks)**

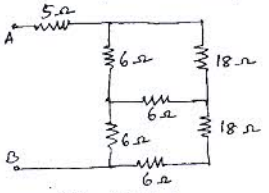

Fig. Q1(a)

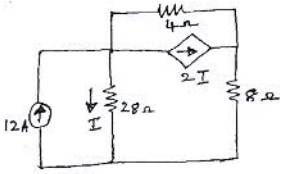

Fig. Q1(b)

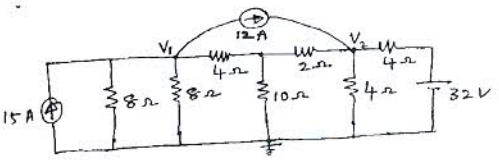

Fig. Q1(c)

2 a. Write the oriented graph of the network shown in Fig. Q2(a). The numerical values of resistances also indicate the branch numbers. Select a tree with branches 1, 2, 3 as the tree branches, write tieset and cutset schedule. **(10 Marks)**

b. For the network shown in Fig. Q2(b), draw the dual network and write the node equations. **(10 Marks)**

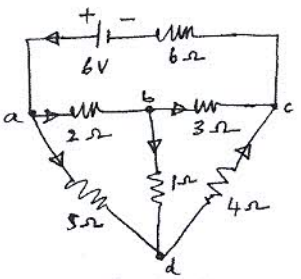

Fig. Q2(a)

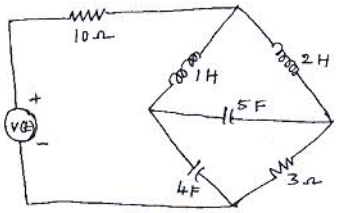

Fig. Q2(b)

3 a. Determine the current through 10 Ω resistance of the network shown in Fig.Q3(a), using superposition theorem. **(10 Marks)**

b. State Milliman's theorem. Using Milliman's theorem, find I_L through R_L for the network shown in Fig. Q3(b). **(10 Marks)**

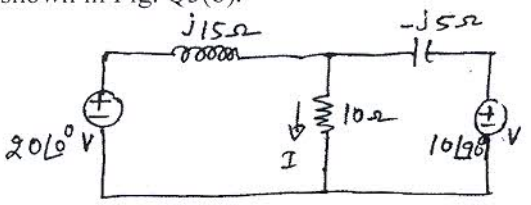

Fig. Q3(a)

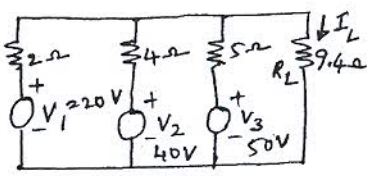

Fig. Q3(b)

4 a. State Thevenin's theorem. For the circuit shown in Fig. Q4(a), find the current through R_L using Thevenin's theorem. **(10 Marks)**

b. State maximum power transfer theorem. For the circuit shown in Fig. Q4(b), find the value of Z_L for which maximum power transfer occurs. Also find P_{max}. **(10 Marks)**

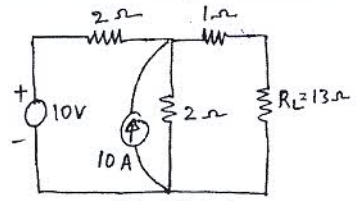

Fig. Q4(a)

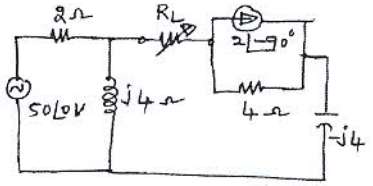

Fig. Q4(b)

PART – B

5 a. Define quality factor and bandwidth. Also establish the relationship between quality factor and bandwidth in a series resonance circuit and thereby prove that $Q = \frac{f_0}{BW}$, where f_0 is the resonance frequency. **(10 Marks)**

b. A series RLC circuit with R = 10 Ω, L = 10mH and C= 1μF has an applied voltage of 200 V at resonant frequency. Calculate the resonant frequency f_0, the current in the circuit at resonance, voltage across the elements at resonance. Also find quality factor and bandwidth. **(10 Marks)**

6 a. Determine : i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t=0+ when the switch is closed at t = 0 in Fig. Q6(a). **(10 Marks)**

b. Determine : i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0 + when the switch K is moved from position 1 to 2 at t = 0 in the network shown in Fig. Q6(b), steady state having reached before switching. **(10 Marks)**

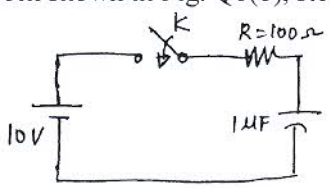

Fig. Q6(a)

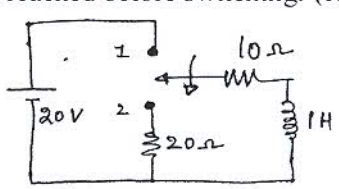

Fig. Q6(b)

7 a. Find the expression for the resultant current i(t) when switch K is closed at t = 0 in Fig. Q7(a). **(10 Marks)**

b. Find the Laplace transform of the given function $f(t) = 5 + 4e^{-2t}$. **(04 Marks)**

c. Find the L.T of the saw tooth waveform in Fig. Q7(c). **(06 Marks)**

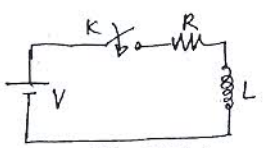

Fig. Q7(a)

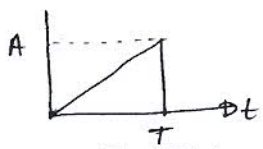

Fig. Q7(c)

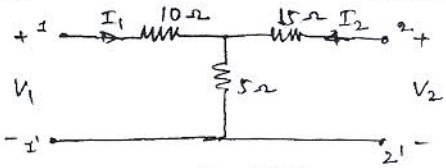

Fig. Q8(a)

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

b. The z-parameters of a two port network are $Z_{11} = 20\ \Omega$, $Z_{22} = 30\ \Omega$, $Z_{12} = Z_{21} = 10\Omega$. Find Y and ABCD parameters of the network. **(10 Marks)**

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