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06ES34

Third Semester B.E. Degree Examination, June/July 2017
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. Reduce the network given in fig. Q1(a) into a single equivalent current source. **(04 Marks)**

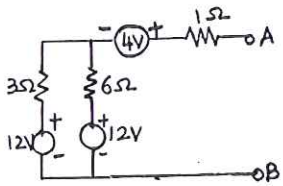


Fig.Q1(a)

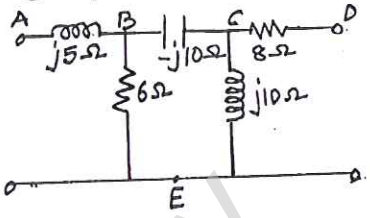


Fig.Q1(b)

b. Obtain the delta connected equivalent network for the network shown in fig. Q1(b). **(06 Marks)**

c. Find the loop currents I_1, I_2 and I_3 in the circuit shown in fig. Q1(c). **(06 Marks)**

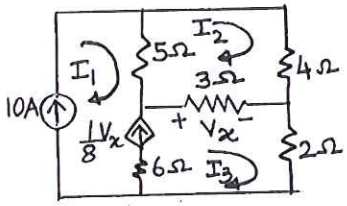


Fig.Q1(c)

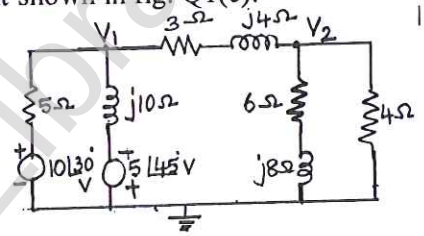


Fig.Q1(d)

d. Write down the node voltage equations for the network shown in fig.Q1(d). **(04 Marks)**

2 a. Define the following with respect to Network Topology :
i) Oriented graph ii) Tree and Co – tree. **(02 Marks)**

b. For the oriented graph in fig. Q2(b) form a tree. Write tie – set schedule and thereby write down the relations between the branch currents and loop currents. **(06 Marks)**

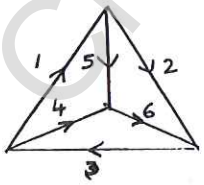


Fig.Q2(b)

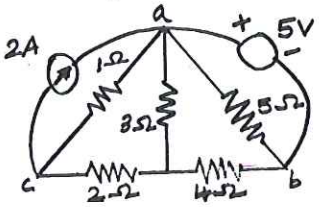
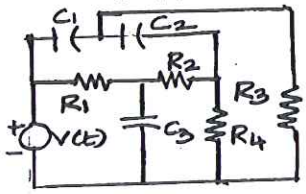


Fig.Q2(c)

c. For the network shown in fig. 2(c), draw the oriented graph, select a tree with branch 1 and 3, obtain equilibrium equations on loop current basis and obtain loop currents. **(08 Marks)**

d. Draw the dual of the network shown in fig.2(d) **(04 Marks)**

Fig.Q2(d)



3 a. In the circuit shown in fig. Q3(a), find the voltage Vx and verify reciprocity theorem. **(06 Marks)**

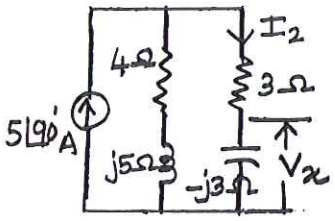


Fig.Q3(a)

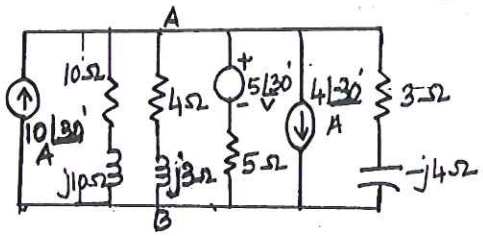
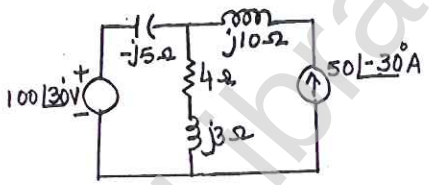


Fig.Q3(b)

b. Using Millman's theorem , find the current flowing through $(4 + j3)\Omega$ in the circuit shown in fig. Q3(b). **(08 Marks)**

c. Using Superposition theorem, find the voltage across $(4 + j3)\Omega$ in the circuit shown in fig.Q3(c). **(06 Marks)**

Fig.Q3(c)



4 a. Find the current in 1Ω resistor of the network in fig.Q4(a) using Thevenin's theorem? **(08 Marks)**

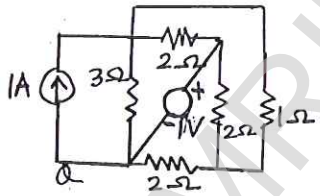


Fig.Q4(a)

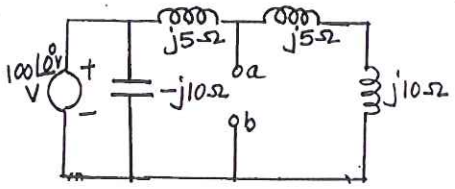
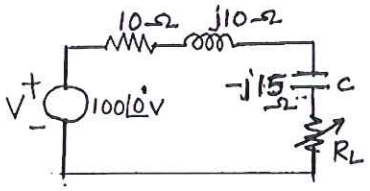


Fig.Q4(b)

b. Find the current through load impedance of $(10-j7.5)\Omega$ connected across the terminals ob in the circuit shown in fig.Q4(b) using Norton's theorem. **(06 Marks)**

c. State maximum Power Transfer theorem. In the network shown in fig. Q4(c), the load consists of a fixed capacitive reactance and a variable resistance R_L. Determine i) the value of R_L for which the transferred is maximum ii) the value of maximum power. **(06 Marks)**

Fig.Q4(c)



PART - B

5 a. What is Quality Factor? Find the quality factor of an inductor and a capacitor. **(05 Marks)**

b. A series RLC circuit consists of a resistance of 1KΩ and an inductance of 100mH in series with capacitance of 10pf. If 100V is applied as input across the combination determine, i) the resonant frequency ii) maximum current in the circuit iii) Q – factor the circuit iv) the half power frequencies. **(07 Marks)**

c. For the parallel resonant circuit shown in fig.Q5(c), show that

$$far = \frac{1}{2\pi\sqrt{LC}}\left[\sqrt{\frac{R_L^2 - L/C}{R_C^2 - L/C}}\right].$$ **(08 Marks)**

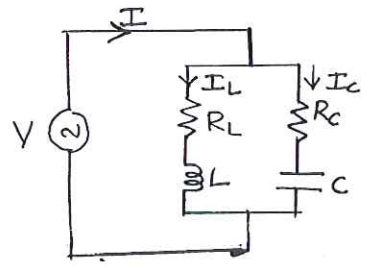


Fig.Q5(c)

6 a. In the network shown in fig. Q6(a), a switch 'S' is moved from position 'a' to position 'b' at t = 0 ; steady state is established previously on position 'a'. Solve for current i(t). **(06 Marks)**

b. In the circuit shown in fig.Q6(b), determine the complete solution for the current, when switch 'K' is closed at t = 0 ; Applied voltage is V(t) which is given as 100 cos $(10^3 t + \pi/2)$. **(10 Marks)**

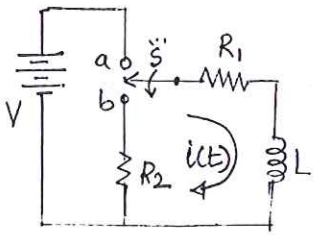


Fig.Q6(a)

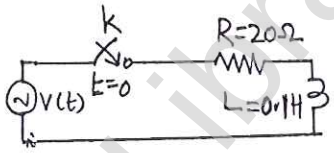


Fig.Q6(b)

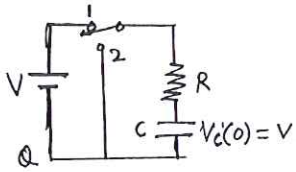


Fig.Q6(c)

c. The switch 'K' is in position 1 for sufficient time to establish steady state refer to fig. Q6(c). At t = 0 the switch is moved to position 2. Find the expression for current. **(04 Marks)**

7 a. In the circuit shown in fig. Q7(a), the initial current in the inductance is 5A and initial voltage on capacitance is 10V with polarities shown. Determine $V_c(t)$ using Laplace transform technique. **(06 Marks)**

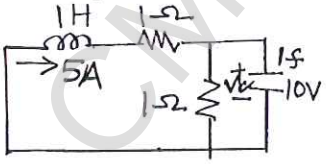


Fig.Q7(a)

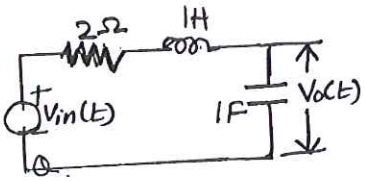


Fig.Q7(b)

b. In the series RLC circuit shown, determine the response in time domain for input voltage of e^{-t} using impulse response. Refer to fig.7(b). **(08 Marks)**

c. Find the Laplace Transform of the function in fig.Q7(c). **(06 Marks)**

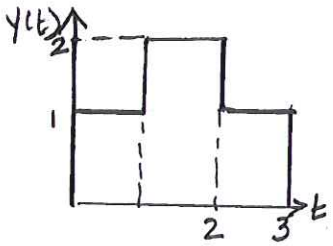
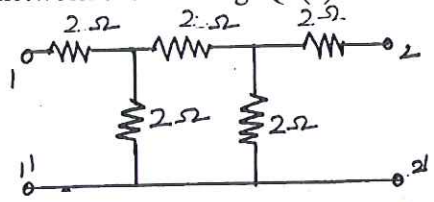


Fig.Q7(c)

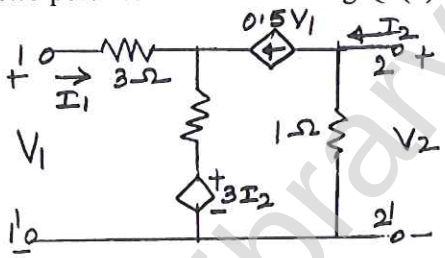
8 a. Find Z – parameters of the network shown in fig. Q8(a). **(08 Marks)**

Fig.Q8(a)



b. Find h – parameters of the two port network shown in fig.Q8(b). **(08 Marks)**

Fig.Q8(b)



c. The Z – parameters of two – port network are $Z_{11} = 20\Omega$, $Z_{22} = 30\Omega$, $Z_{12} = Z_{21} = 10\Omega$. Find ABCD parameters of the network. **(04 Marks)**

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