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10ES34

**Third Semester B.E. Degree Examination, Dec.2016/Jan.2017**

**Network Analysis**

Time: 3 hrs.

Max. Marks:100

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

**PART - A**

- 1 a. Using source transformation and shifting, obtain the power consumed in  $8\Omega$  resistance of the network shown in Fig.Q1(a). (06 Marks)
- b. Determine all the node voltages of the circuit shown in Fig.Q1(b) using nodal analysis. (06 Marks)
- c. Find the value of  $V_s$  such that the current in  $-j11\Omega$  is zero, use mesh analysis assuming all the loop currents are in clockwise directions. Refer Fig. 1(c). (08 Marks)

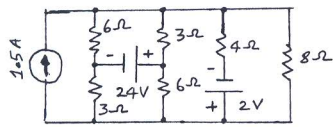


Fig. Q1(a)

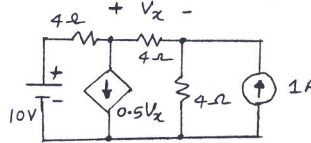


Fig. Q1(b)

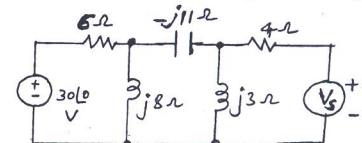


Fig. Q1(c)

- 2 a. Draw the dual of the network shown in Fig. 2(a). Write the corresponding equations for both networks. (08 Marks)
- b. Draw the graph of the network shown in Fig. Q2(b), select links as the branches containing voltage sources. Write tie-set schedule and there from obtain all the branch currents and voltages. (12 Marks)

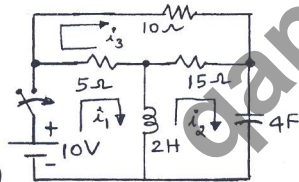


Fig.Q2(a)

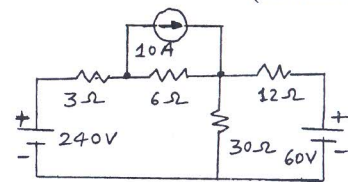


Fig. Q2(b)

- 3 a. Determine the current and voltage across  $4\Omega$  resistance of the network shown in Fig. Q3(a), using superposition theorem. (06 Marks)
- b. Apply Millman's theorem to find  $V_0$  and  $I_0$  for the circuit shown in Fig. 3(b). (08 Marks)
- c. State and explain the reciprocity theorem. (06 Marks)

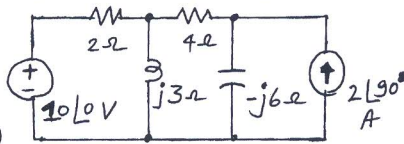


Fig.Q3(a)

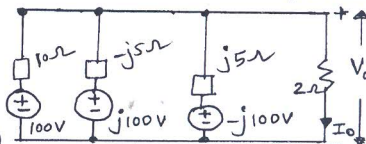


Fig. Q3(b)

- 4 a. A linear bilateral network consisting of passive elements is shown in Fig. 4(a), with  $V_s = 10V$ ,  $V_{ab}$  is  $5V$ . If 'ab' is shorted,  $I_{ab} = 1A$  for  $V_s = 15V$ . Determine the current when  $R_{ab} = 2.5\Omega$  with  $V_s = 12V$ . (04 Marks)
- b. Determine the Norton's equivalent of the circuit shown in Fig. 4(b). (08 Marks)
- c. What value of impedance  $Z_L$  results in maximum power transfer condition for the network shown in Fig. Q4(c)? Also determine the corresponding power. (08 Marks)

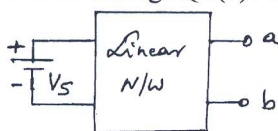


Fig. Q4(a)

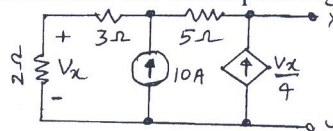


Fig. Q4(b)

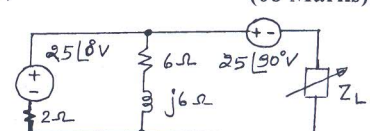


Fig. Q4(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - B

- 5 a. A series R - L - C circuit is fed with 50 V rms supply. At resonance, the current through the circuit is 25A and the voltage across inductor is 1250 volts. If  $C = 4 \mu\text{F}$ , determine the values of R, L Q, resonant frequency, bandwidth and half power frequencies. (12 Marks)  
 Obtain the condition for resonance of elements as shown in Fig. 5(b). Derive the expression  
 b. for total impedance at resonance. (08 Marks)

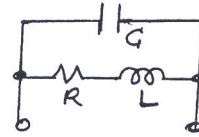


Fig. Q5(b)

- 6 a. The switch 'K' in the circuit shown in Fig. 6(a) is in open position for a long time and at time  $t = 0$ , it is closed. Determine the values of  $i_1$  and  $i_2$  along with their first and second derivatives at  $t = 0+$ . (10 Marks)  
 b. The switch 'S' is changed from position 1 to 2 at time  $t = 0$ . The circuit was under steady state before this action. Determine the value of  $v$  and  $i$  at  $t = 0+$  and their first and second derivatives also. Refer Fig. 6(b). (10 Marks)

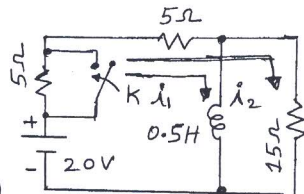


Fig. Q6(a)

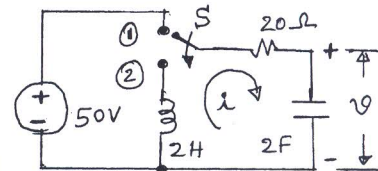


Fig. Q6(b)

- 7 a. Using Laplace transformation method obtain the expression for  $i(t)$ . The capacitor charge is zero initially. Also obtain the expression for capacitor voltage in 'S' domain, refer Fig. 7(a). (10 Marks)  
 b. Using standard waveforms, express the waveform given (periodic) in Fig. 7(b) and obtain its Laplace transform. (10 Marks)

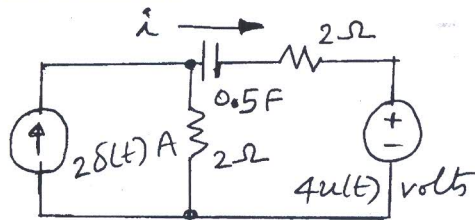


Fig. Q7(a)

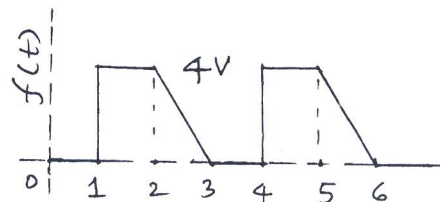


Fig. Q7(b)

- 8 a. Determine the Y-parameters of the network shown in Fig. Q8(a), (10 Marks)  
 b. Replace the circuit shown in Fig. 8(b) with its hybrid parameter equivalent network. (10 Marks)

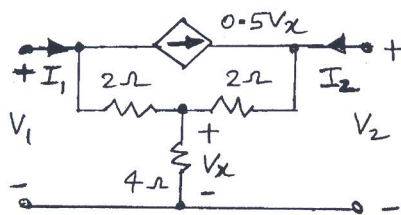


Fig. Q8(a)

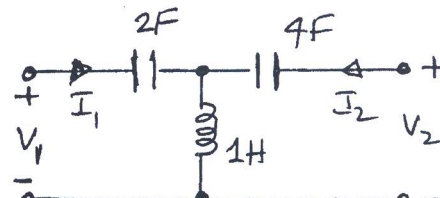


Fig. Q8(b)

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