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## Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Network Analysis

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Reduce the network shown in Fig.Q1(a) to a single voltage source in series with a resistance using source shift and source transformations.

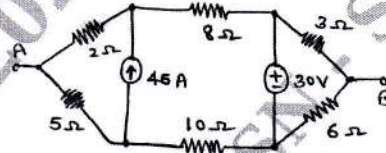


Fig.Q1(a)

(08 Marks)

- b. Using star/delta transformation, determine the resistance between M and N for the network shown in Fig.Q1(b).

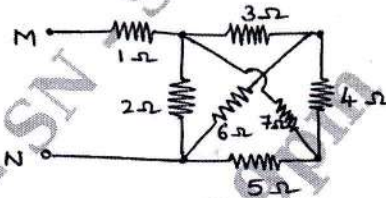


Fig.Q1(b)

(08 Marks)

### OR

- 2 a. Find the power delivered by the dependent voltage source in the circuit shown in Fig.Q2(a) by Mesh current method.

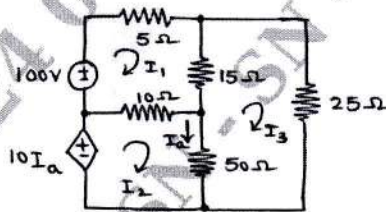


Fig.Q2(a)

(06 Marks)

- b. Define super Mesh and super node. (02 Marks)  
c. Use the node-voltage method to find the power developed by the 20V source in the circuit shown in Fig.Q2(c).

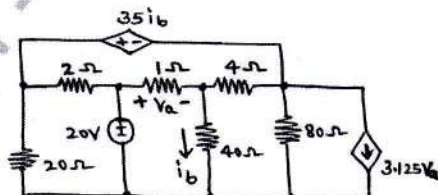


Fig.Q2(c)

(08 Marks)



**Module-2**

- 3 a. Using Millman's theorem, find the current through load resistance  $R_L$  for the circuit shown in Fig.Q3(a). (08 Marks)

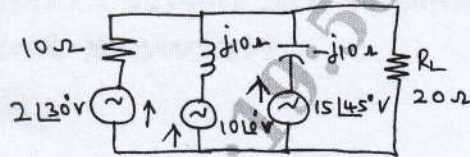


Fig.Q3(a)

- b. State the maximum power transfer theorem and also prove that  $P_{max} = \frac{V_{th}^2}{4R_L}$ , where  $V_{th}$  = thevenins voltage. (08 Marks)

OR

- 4 a. Obtain the Thevenin's equivalent of the circuit shown in Fig.Q4(a). (08 Marks)  
 b. Using superposition theorem, find the current in  $6\Omega$  resistor in the network shown in Fig.Q4(b).

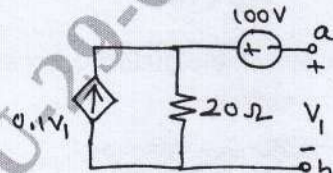


Fig.Q4(a)

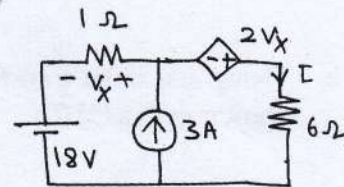


Fig.Q4(b)

(08 Marks)

**Module-3**

- 5 a. In the network shown in Fig.Q5(a), 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  $R = 1000\Omega$ ,  $L = 1H$ ,  $C = 0.1\mu F$  and  $V = 100V$ . Assume that the capacitor is initially uncharged.

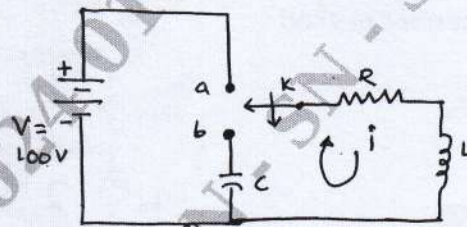


Fig.Q5(a)

(08 Marks)

- b. Determine the response current  $i(t)$  in the circuit shown in Fig.Q5(b) using Laplace transform.

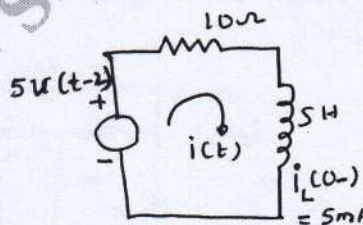


Fig.Q5(b)

(08 Marks)

OR

- 6 a. Synthesis the waveform shown in Fig.Q6(a) and find the Laplace transform of the periodic waveform. (08 Marks)

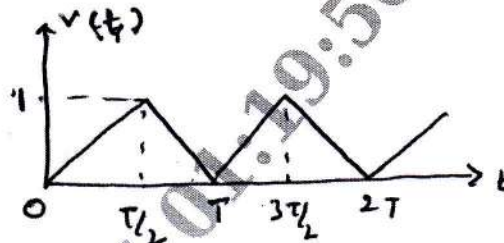


Fig.Q6(a)

- b. Determine  $v$ ,  $\frac{dv}{dt}$  and  $\frac{d^2v}{dt^2}$  at  $t = 0^+$  when the switch  $k$  is opened at  $t=0$  in Fig.Q6(b).

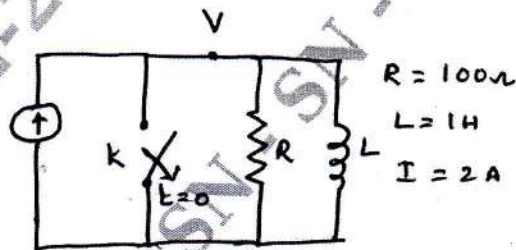


Fig.Q6(b)

(08 Marks)

**Module-4**

- 7 a. Derive the expressions of half power frequencies  $W_1$  and  $W_2$  and also bandwidth of a series resonance circuit. (09 Marks)  
 b. Find the values of  $L$  at which the circuit shown in Fig.Q7(b) resonates at a frequency of 500 r/s.

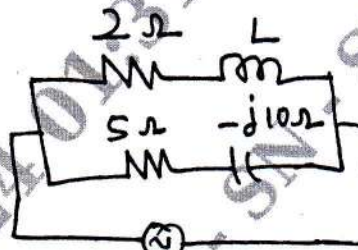


Fig.Q7(b)

(07 Marks)

OR

- 8 a. Derive the expressions of a resonance frequency and dynamic impedance of a parallel resonance circuit. (09 Marks)  
 b. A coil has a  $R = 20\Omega$ ,  $L = 80\text{mH}$  and  $C = 100\text{pF}$  are connected in series. Determine :  
 i) impedance at resonance ii) resonance frequency iii) quality factor iv) circuit current if supply voltage is 50V. (07 Marks)



**Module-5**

- 9 a. Derive Y parameters and transmission parameters of a circuit in terms of its z-parameters. (08 Marks)  
 b. Find the z-parameters for the network shown in Fig.Q9(b).

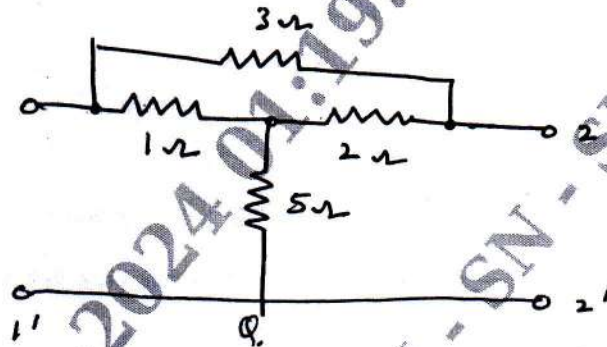


Fig.Q9(b)

(08 Marks)

OR

- 10 a. 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. (08 Marks)  
 b. Determine Y parameters of the two port network shown in Fig.Q10(b).

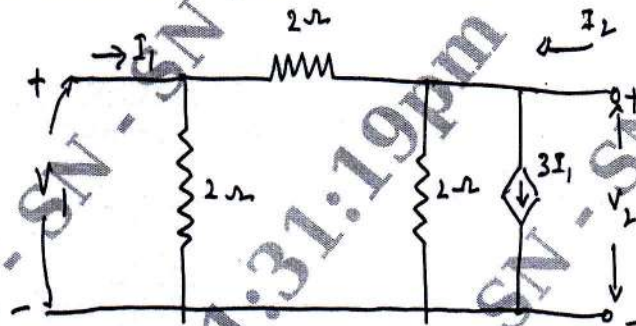


Fig.Q10(b)

(08 Marks)

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