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## Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Network Theory

Time: 3 hrs.

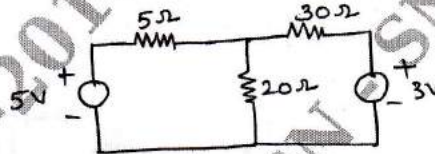
Max. Marks: 100

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

### Module-1

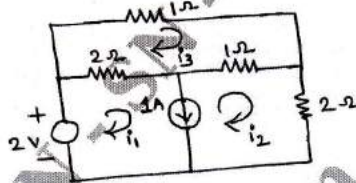
- 1 a. Using source transformation technique find the current through  $5\Omega$  resistor for the circuit shown in Fig.Q.1(a) (06 Marks)

Fig.Q.1(a)



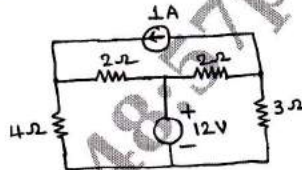
- b. Use Mesh Analysis to determine the Mesh currents  $i_1$ ,  $i_2$  and  $i_3$  for the network shown in Fig.Q.1(b). (06 Marks)

Fig.Q.1(b)



- c. Find the power delivered by 1A current source using nodal analysis for the circuit shown in Fig.Q.1(c). (08 Marks)

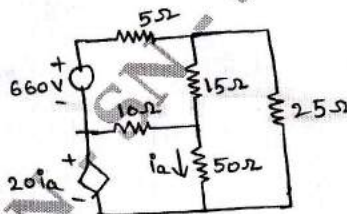
Fig.Q.1(c)



**OR**

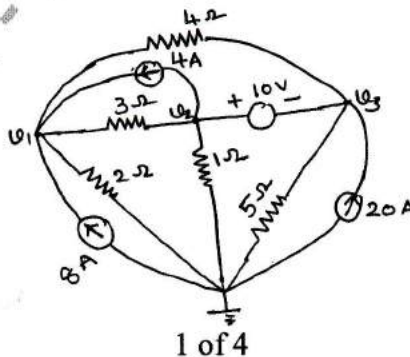
- 2 a. Three Impedances are connected in delta, obtain the star equivalent of the network. (06 Marks)
- b. Use Mesh Analysis to find the power delivered by the dependent voltage source in the circuit shown in Fig.Q.2(b). (06 Marks)

Fig.Q.2(b)



- c. Determine all the node voltages for the circuit shown in Fig.Q.2(c) using nodal analysis. (08 Marks)

Fig.Q.2(c)



**Module-2**

- 3 a. State and explain superposition theorem (06 Marks)  
 b. Use Millman's Theorem to find the current flowing through  $(2 + j3)\Omega$  impedance for the circuit shown in Fig.Q.3(b). (08 Marks)

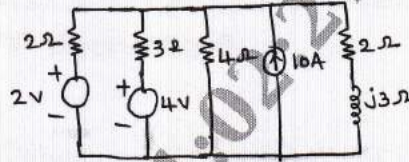


Fig.Q.3(b)

- c. State and prove Norton's theorem. (06 Marks)

**OR**

- 4 a. Find the Thevenin's equivalent for the circuit shown in Fig.Q.4(a) with respect to terminals X-Y. (08 Marks)

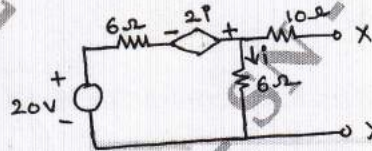


Fig.Q.4(a)

- b. Find the condition for maximum power transfer in the AC circuit, where both  $R_L$  and  $X_L$  are varying. (06 Marks)  
 c. Determine the current through the load resistance using Norton's Theorem for the circuit shown in Fig.Q.4(c). (06 Marks)

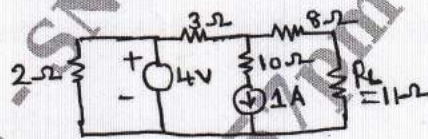


Fig.Q.4(c)

**Module-3**

- 5 a. Explain the behavior of R, L, C elements at the time of switching at  $t = 0$ , at  $t = 0^+$  and  $t = \infty$ . (07 Marks)  
 b. In the network shown in Fig.Q.5(b). Find  $i$ ,  $\frac{di}{dt}$  and  $\frac{d^2i}{dt^2}$  at  $t = 0^+$ . Assume that the capacitor is initially uncharged. (07 Marks)

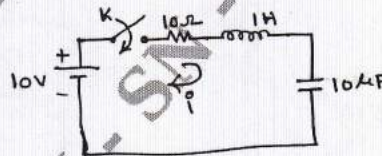


Fig.Q.5(b)

- c. In the network shown in Fig.Q.5(c) find,  $i$ ,  $\frac{di}{dt}$  and  $\frac{d^2i}{dt^2}$  at  $t = 0^+$ . The switch k is closed at  $t = 0$  with zero current in the inductor. (06 Marks)

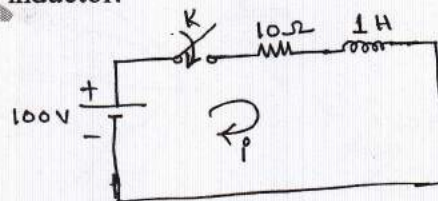


Fig.Q.5(c)

OR

- 6 a. In the network shown in Fig.Q.6(a). The switch  $k$  is changed from position  $a$  to  $b$  at  $t = 0$ , the steady state is reached at position  $a$ . Find  $i$ ,  $\frac{di}{dt}$  and  $\frac{d^2i}{dt^2}$  at  $t = 0^+$ . Assume that the capacitor is initially uncharged. (10 Marks)

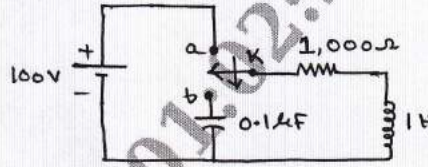


Fig.Q.6(a)

- b. For the network shown in Fig.Q.6(b). The network is in steady state with switch  $k$  is closed. At  $t = 0$ , the switch is opened. Determine the voltage across the switch  $V_k$  and  $\frac{d}{dt}V_k$  at  $t = 0^+$ . (10 Marks)

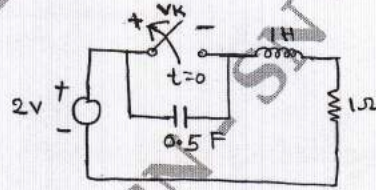


Fig.Q.6(b)

**Module-4**

- 7 a. Obtain Laplace transform of  
 i) Step function  
 ii) Ramp function  
 iii) Impulse function. (09 Marks)
- b. Find the Laplace transform of the periodic signal  $x(t)$  as shown in Fig.Q.7(b). (11 Marks)



Fig.Q.7(b)

OR

- 8 a. In the series RL circuit shown in Fig.Q.8(a), the source voltage is  $v(t) = 50 \sin 250t$  V. Using Laplace transform determine, the current when switch  $K$  is closed at  $t = 0$ . (10 Marks)

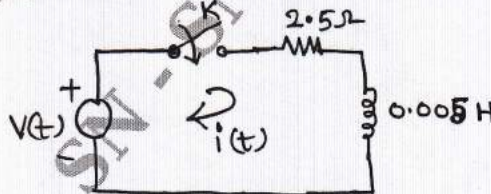


Fig.Q.8(a)

- b. Find the Laplace transform of the non-sinusoidal periodic waveform shown in Fig.Q.8(b)

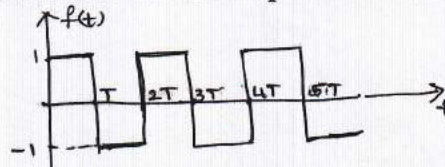


Fig.Q.8(b)

(10 Marks)

**Module-5**

- 9 a. Define Z parameters. Determine Z parameters in terms of Y parameters. (06 Marks)
- b. Determine h parameters of the circuit shown in Fig.Q.9(b) (07 Marks)

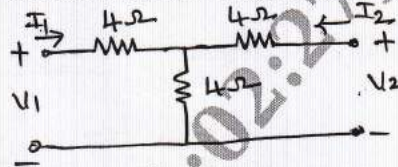


Fig.Q.9(b)

- c. For the network shown in Fig.Q.9(c). Find the transmission parameters. (07 Marks)

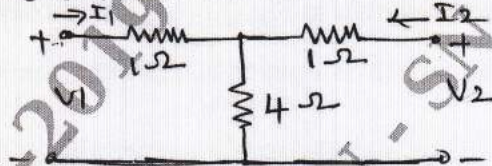


Fig.Q.9(c)

OR

- 10 a. Define Q-factor, selectivity and Band width. (03 Marks)
- b. A series RLC circuit has a resistance of  $10\Omega$ , an inductance of  $0.3H$  and a capacitance of  $100\mu F$ . The applied voltage is  $230V$ . Find: i) The resonant frequency ii) lower and upper cut off frequencies iii) current at resonance iv) currents at  $f_1$  and  $f_2$  v) Voltage across the inductance at resonance. (07 Marks)
- c. Derive the expression for the resonant frequency of the circuit shown in Fig.Q.10(c). Also show that the circuit will resonate at all frequency if  $R_L = R_C = \sqrt{\frac{L}{C}}$  (10 Marks)

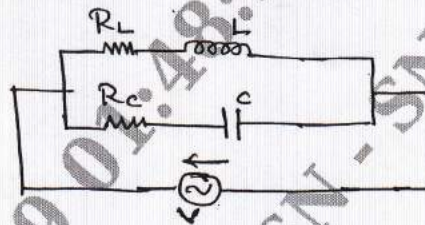


Fig.Q.10(c)

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