

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

Time: 3 hrs.

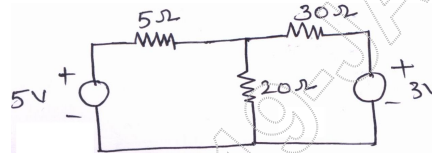
Max. Marks: 100

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

Module-1

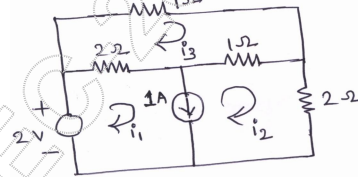
- 1 a. Using source transformation technique find the current through 5Ω resistor for the circuit shown in Fig.Q.1(a) (06 Marks)

Fig.Q.1(a)



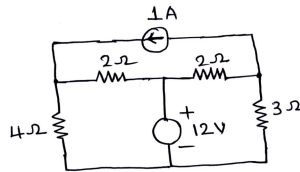
- b. Use Mesh Analysis to determine the Mesh currents i_1 , i_2 and i_3 for the network shown in Fig.Q.1(b). (06 Marks)

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)

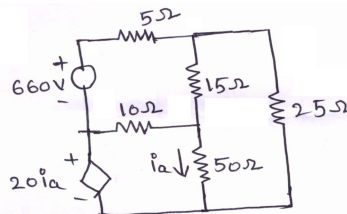
Fig.Q.1(c)



OR

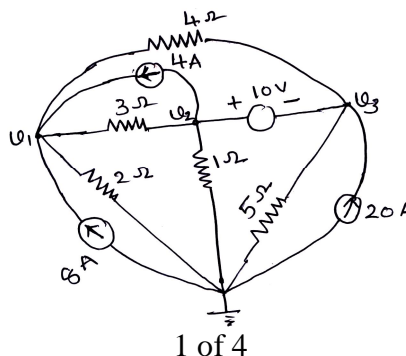
- 2 a. Three Impedances are connected in delta, obtain the star equivalent of the network. (06 Marks)
b. Use Mesh Analysis to find the power delivered by the dependent voltage source in the circuit shown in Fig.Q.2(b). (06 Marks)

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)

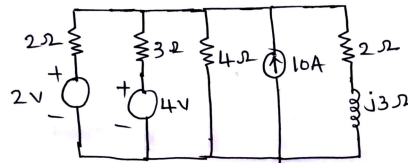


Fig.Q.3(b)

- 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)

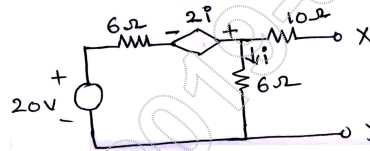


Fig.Q.4(a)

- 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)

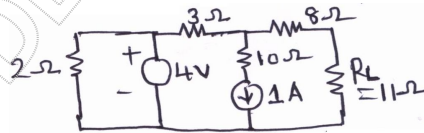


Fig.Q.4(c)

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)

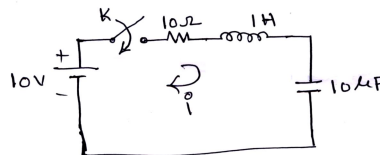


Fig.Q.5(b)

- 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)

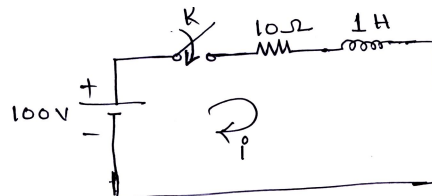


Fig.Q.5(c)

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)

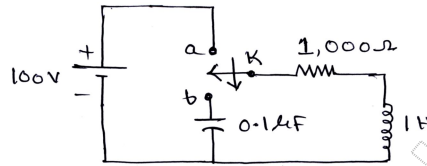


Fig.Q.6(a)

- 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)

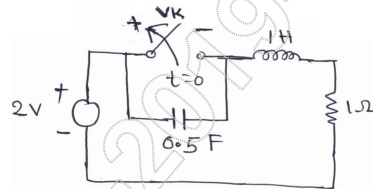


Fig.Q.6(b)

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)

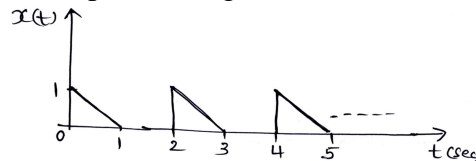


Fig.Q.7(b)

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)

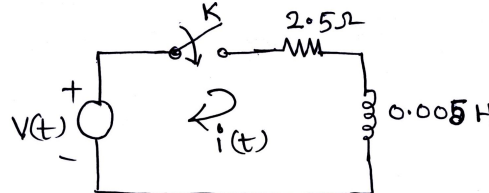


Fig.Q.8(a)

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

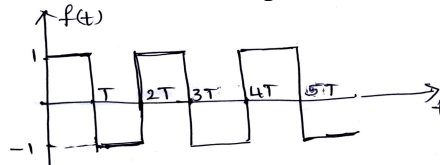


Fig.Q.8(b)

(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)

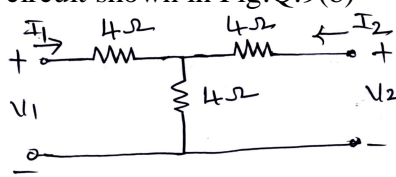


Fig.Q.9(b)

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

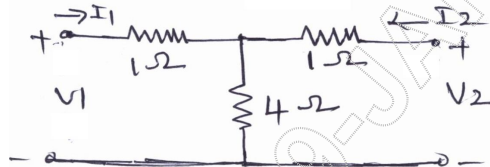


Fig.Q.9(c)

OR

- 10 a. Define Q-factor, selectivity and Band width. (03 Marks)
- b. A series RLC circuit has a resistance of 10Ω , an inductance of 0.3H and a capacitance of $100\mu\text{F}$. 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)

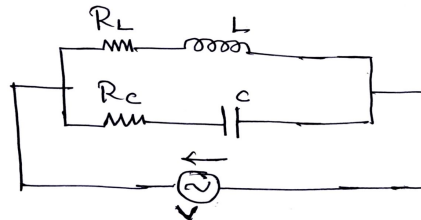


Fig.Q.10(c)

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