USN

10ES34

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Network Analysis

Time: 3 hrs. Max. Marks:100

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

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 – A

1 a. Find the voltage drop across each current source shown in Fig Q1(a). Using Nodal analysis.

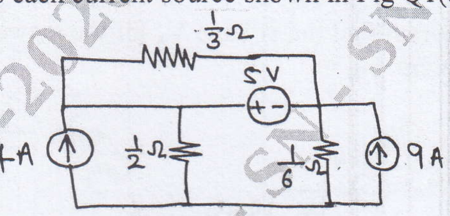

Fig Q1(a) **(07 Marks)**

b. Use Mesch analysis, find I_x in the circuit shown in Fig Q1(b).

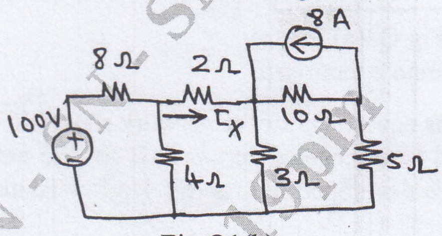

Fig Q1(b) **(07 Marks)**

c. Reduce the network shown in Fig Q1(c) in to a single source with series resistance across the terminal A-B.

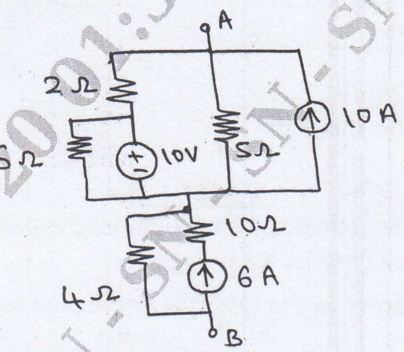

Fig Q1(c) **(06 Marks)**

2 a. Define the following terms with respect to Network Topology with example :
i) Oriented graph ii) Tree iii) Tie set. **(06 Marks)**

b. Draw the oriented graph for the incidence Matrix shown **(07 Marks)**

$$A = \begin{bmatrix} 1 & 0 & -1 & 0 & 1 & 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & 1 & -1 & 0 & 1 & 0 & -1 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & -1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & 1 & -1 & 1 \end{bmatrix}$$

c. Draw the Dual of the network shown in Fig Q2(c).

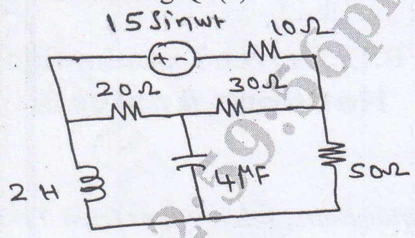

Fig Q2(c) **(07 Marks)**

3 a. Using super position theorem find the voltage V_x in the network shown in Fig Q3(a). **(08 Marks)**

b. Using Reciprocity theorem find the voltage V_x for the network shown in Fig Q3(b) and also verify reciprocity theorem. **(08 Marks)**

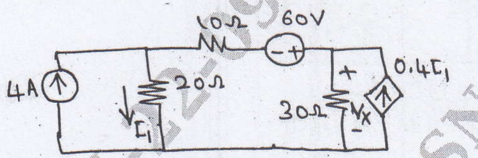

Fig Q3(a)

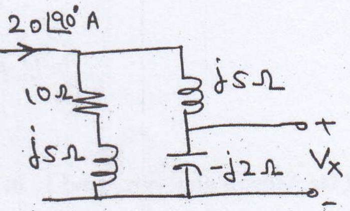

Fig Q3(b)

c. State and explain Milliman's theorems. **(04 Marks)**

4 a. Determine the thevenins equivalent of the network shown in Fig Q4(a). **(08 Marks)**

b. What resistance should be connected across A-B for the network shown in Fig Q4(b) such that maximum power is developed across this load resistance? What is value of maximum power? **(08 Marks)**

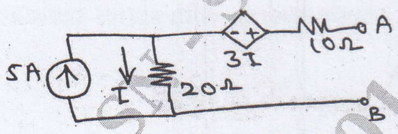

Fig Q4(a)

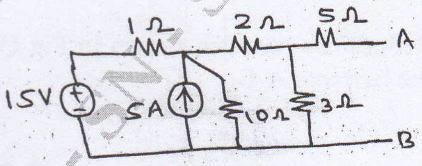

Fig Q4(b)

c. State and explain Norton's theorem. **(04 Marks)**

PART – B

5 a. Show that the value of the inductor for maximum voltage across it in case of inductor tuning of series resonance is $L = C[R^2 + X_C^2]$. **(07 Marks)**

b. Shown that the circuit shown in Fig Q5(b) is resonant at supply frequency.

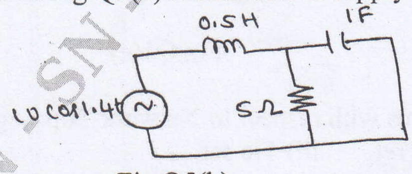

Fig Q5(b) **(06 Marks)**

c. A coil of resistance 20Ω and inductance 10mH is in series with a capacitance and is supplied with a constant voltage, variable frequency source. The maximum current is 2A at 1000Hz. Find the half cutoff frequencies. **(07 Marks)**

6 a. What is the reason of studying initial and final conditions? Also write the procedure for evaluating initial conditions. **(04 Marks)**

b. For the Network shown in Fig Q6(b), if the capacitor is initially uncharged, determine the value of $\frac{d^2V^2}{dt^2}$ and $\frac{d^3V_2}{dt^3}$ at $t = 0^+$, Assume $V_1(t) = \begin{cases} e^{-t}, & t \geq 0 \\ 0, & t < 0 \end{cases}$ **(08 Marks)**

c. For the circuit shown in Fig Q6(c), switch K is closed at t = 0 with zero current in the inductor, Find the value of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ **(08 Marks)**

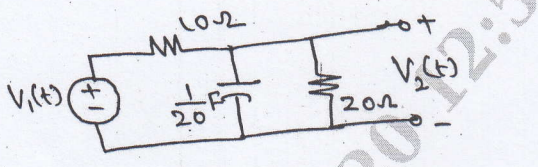

Fig Q6(b)

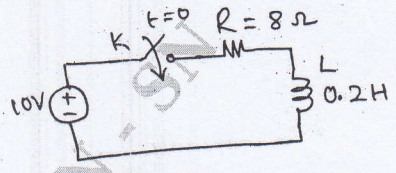

Fig Q6(c)

7 a. What are the advantages of Laplace transformation method? Find the Laplace transform of the waveform. Shown in Fig Q7(a).

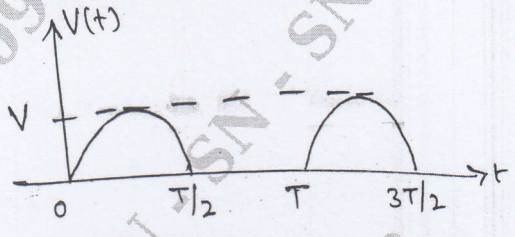

Fig Q7(a) **(10 Marks)**

b. Find the node voltage $V_1(t)$ and $V_2(t)$ using Laplace transformation method when the switch is open at t = 0 for the circuit shown in Fig Q7(b). Steady state condition is achieved with switch is closed.

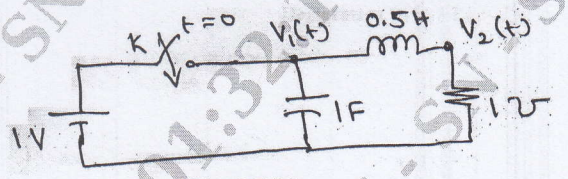

Fig Q7(b) **(10 Marks)**

8 a. Find the Z and Y-parameters for the two part network shown in Fig Q8(a).

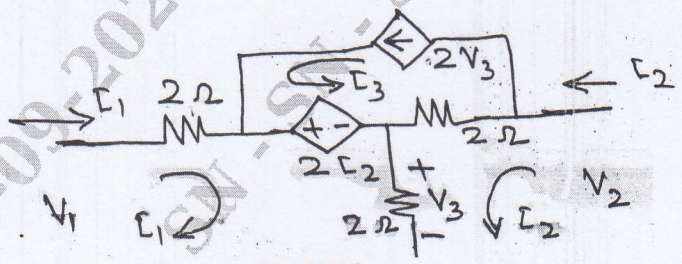

Fig Q8(a) **(10 Marks)**

b. Find the T-parameter for the network shown in Fig Q8(b) and also obtain Z-parameter

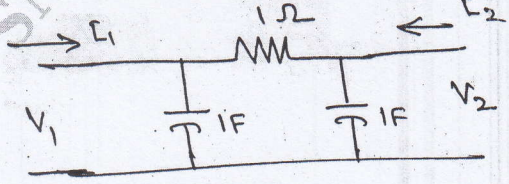

Fig Q8(b) **(10 Marks)**