USN

18EC32

Third Semester B.E. Degree Examination, July/August 2021

Network Theory

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

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.

1 a. Find the equivalent resistance Rab for circuit in Fig. Q1 (a) and use it to find i. **(06 Marks)**

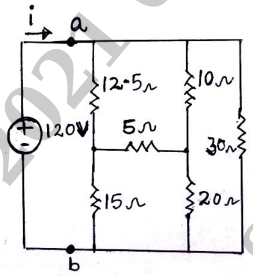

Fig. Q1 (a)

b. Determine power supplied by the dependent source of Fig. Q1 (b), using nodal analysis. **(06 Marks)**

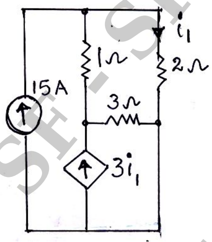

Fig. Q1 (b)

c. Determine current through 2 Ω resistor of Fig. Q1 (c) using mesh analysis. **(08 Marks)**

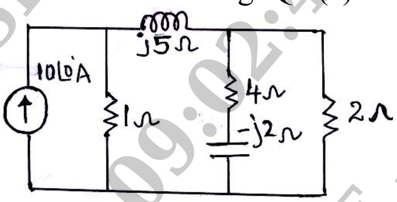

Fig. Q1 (c)

2 a. Using source transformation and source shifting techniques, find voltage across 2 Ω resistor in Fig. Q2 (a). **(06 Marks)**

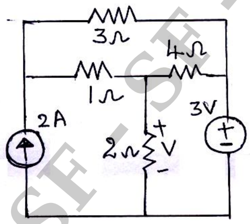

Fig. Q2 (a)

b. Find I_1, I_2, I_3 in the circuit of Fig. Q2 (b) using mesh analysis. **(06 Marks)**

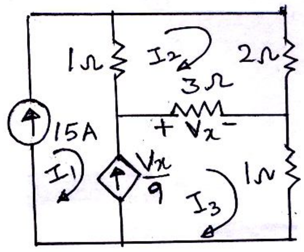

Fig. Q2 (b)

c. Compute V_1, V_2 in the circuit of Fig. Q2 (c) using nodal analysis. **(08 Marks)**

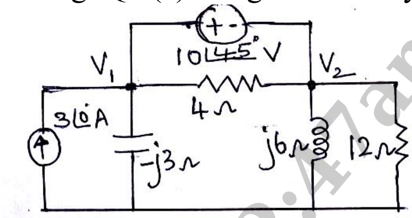

Fig. Q2 (c)

3 a. For the circuit in Fig. Q3 (a), use the superposition theorem to find I. **(06 Marks)**

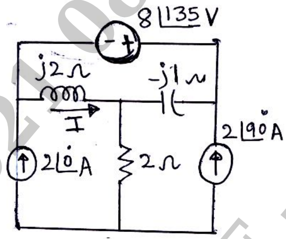

Fig. Q3 (a)

b. Using Norton's theorem, find current through 5 Ω resistor in Fig. Q3 (b). **(06 Marks)**

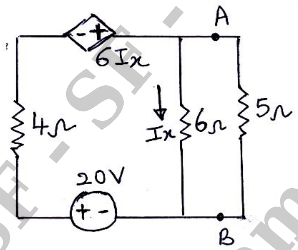

Fig. Q3 (b)

c. State Millman's theorem, using Millman's theorem find I_L in Fig. Q3 (c). **(08 Marks)**

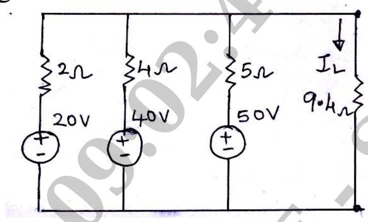

Fig. Q3 (c)

4 a. Determine the Thevenin equivalent at terminals A-B of the circuit in Fig. Q4 (a). **(06 Marks)**

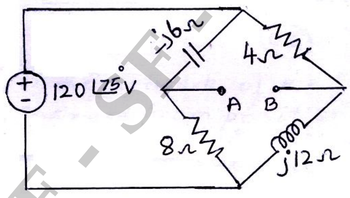

Fig. Q4 (a)

b. Compute the value of R that results in maximum power transfer to it in Fig. Q4 (b). Find the maximum power. **(06 Marks)**

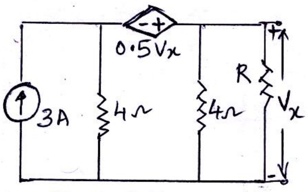

Fig. Q4 (b)

c. State Reciprocity theorem. Find V_x and verify Reciprocity theorem for circuit in Fig. Q4 (c). **(08 Marks)**

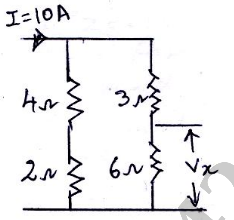

Fig. Q4 (c)

5 a. In the network shown in Fig. Q5 (a), the switch K is opened at t = 0. Solve for the values of V, $\frac{dV}{dt}$ and $\frac{d^2V}{dt^2}$ at $t = 0^+$. **(10 Marks)**

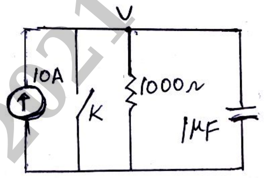

Fig. Q5 (a)

b. In the network shown in Fig. Q5 (b), a steady state is reached with the switch K open. At t = 0 switch K is closed. Solve for the values of I_1, I_2, V_C, $\frac{dI_1}{dt}$, $\frac{dI_2}{dt}$ at $t = 0^+$. **(10 Marks)**

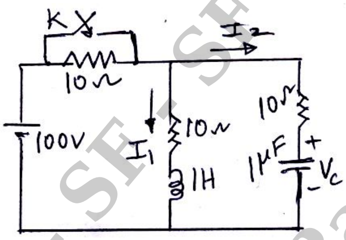

Fig. Q5 (b)

6 a. In the network shown in Fig.6(a), K is changed from position a to b at t = 0. Solve for i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$, The steady state having reached before switching. **(10 Marks)**

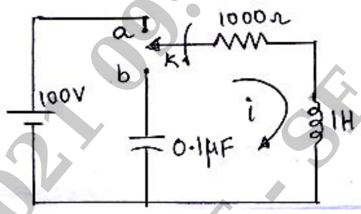

Fig. Q6 (a)

b. In the network of Fig. Q6(b), the switch K is closed at t = 0 with zero capacitor voltage and zero inductor current. Solve for (a) V_1 and V_2 at $t = 0^+$ (b) V_1 and V_2 at $t = \infty$, (c) $\frac{dV_1}{dt}$ and $\frac{dV_2}{dt}$ at $t = 0^+$, (d) $\frac{d^2V_2}{dt^2}$ at $t = 0^+$. **(10 Marks)**

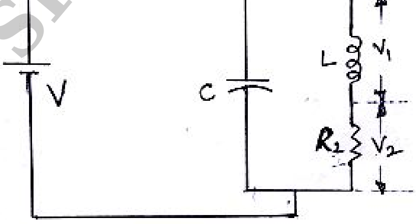

Fig. Q6 (b)

7 a. In the circuit given in the Fig. Q7 (a) switch is closed on position 1 at t = 0 and at t = 500 μs, switch is moved to position 2. Obtain the equation of current in both intervals. Use Laplace transforms. **(10 Marks)**

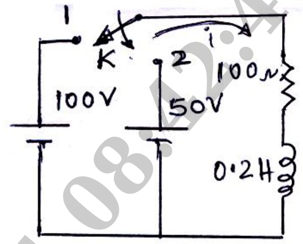

Fig. Q7 (a)

b. Determine the Laplace transform of the periodic sawtooth waveform, as shown in Fig. Q7 (b). **(10 Marks)**

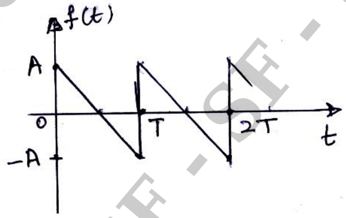

Fig. Q7 (b)

8 a. A voltage pulse, of unit height and width T is applied to the circuit in the Fig. Q8 (a) at t = 0. Determine the voltage across the capacitance C as a function of time. **(10 Marks)**

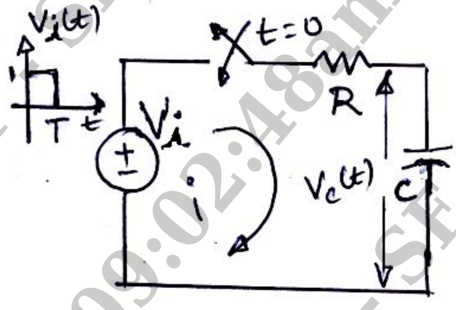

Fig. Q8 (a)

b. Determine the Laplace transform of waveform given in Fig. Q8 (b). **(10 Marks)**

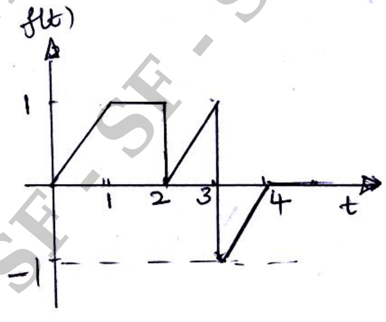

Fig. Q8 (b)

9 a. With respect to series resonant circuit, show that resonant frequency is equal to the geometric mean of two half power frequencies. **(08 Marks)**

b. A series resonant circuit includes 1 μF capacitor, resistance of 16 Ω and an inductance of L henry. If the bandwidth is 500 rad/sec, determine (i) ω_r (ii) Q (iii) L. **(06 Marks)**

c. Find the value of L for which the circuit resonates at a frequency of 1000 rad/sec for the circuit in the Fig. Q9 (c). **(06 Marks)**

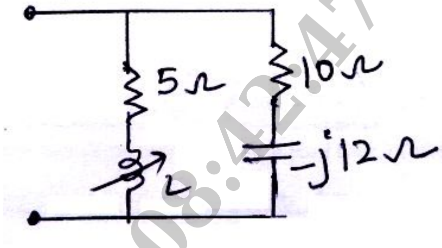

Fig. Q9 (c)

10 a. Derive Z-parameters in terms of hybrid parameters. **(08 Marks)**

b. Determine the Z-parameters of the network shown in Fig. Q10 (b). **(06 Marks)**

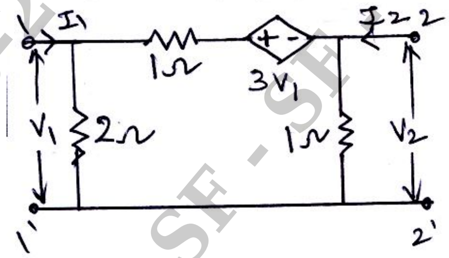

Fig. Q10 (b)

c. For the network shown in Fig. Q10 (c), find the Y parameters. **(06 Marks)**

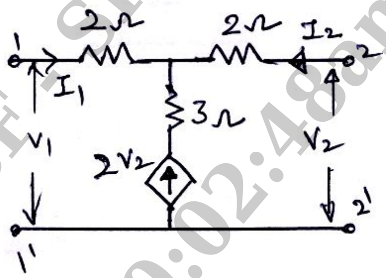

Fig. Q10 (c)

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