CBCS SCHEME

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15EE32

Third Semester B.E. Degree Examination, June/July 2019
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Write a system of modal equations for the circuit of Fig.Q1(a) using the nadal voltages v_1 and v_2 as the variables. What power is furnished by the 5Vy dependent source? **(10 Marks)**

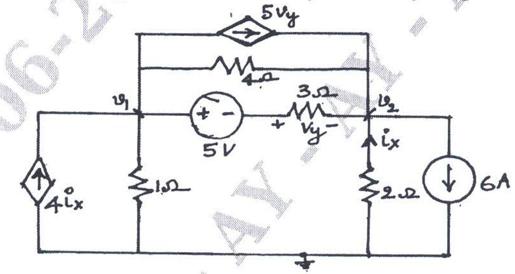

Fig.Q1(a)

b. Find Req for the network shown in Fig.Q1(b) below at points BC. **(06 Marks)**

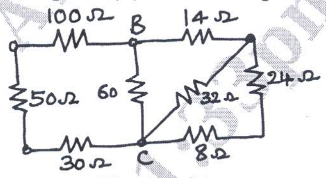

Fig.Q1(b)

OR

2 a. In the network of Fig.Q2(a) determine v_2 such that the current in the impedance (2 + j3) is zero. Use Mesh analysis. **(06 Marks)**

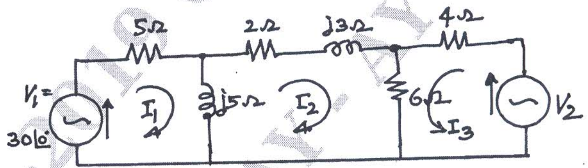

Fig.Q2(a)

b. A tank circuit is supplied by a current source whose source resistance is 56 kΩ. The tank circuit is composed of a 56 nF capacitor in parallel with a coil whose inductance and resistance are 35 mH and 80 Ω respectively. Find (i) Input impedance at resonance (ii) Quality factor of the circuit and (iii) Half power frequencies (f_1 & f_2). **(10 Marks)**

Module-2

3 a. Determine the current in R = 1 Ω resistor of the network shown in Fig.Q3(a) using Thevenin's and Superposition theorem simultaneously. **(10 Marks)**

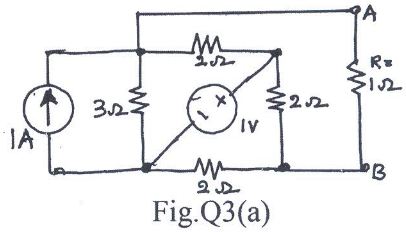

Fig.Q3(a)

b. In the network shown in Fig.Q3(b) determine the voltage 'V_x'. Then apply the reciprocity theorem. And compare two voltages. **(06 Marks)**

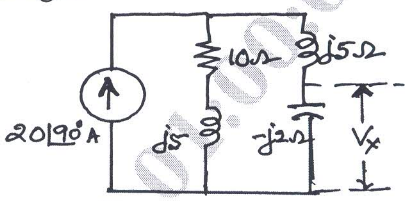

Fig.Q3(b)

OR

4 a. Obtain the Thevenin's equivalent network across the output terminals 'A' and 'B' of the network shown in Fig.Q4(a). **(10 Marks)**

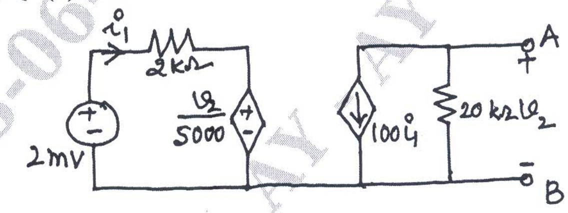

Fig.Q4(a)

b. Use Millman's theorem to find the current I through $R_4 = 5\ \Omega$ in the network shown in Fig.Q4(b). **(06 Marks)**

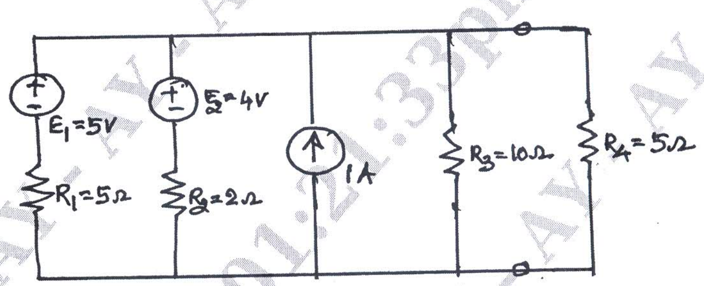

Fig.Q4(b)

Module-3

5 a. Fig.Q5(a) shows a network with zero capacitor voltage and zero inductor current when the switch K is open. At t = 0 the switch K is closed.

Solve for (i) V_1 and V_2 at $t = 0^+$ (ii) $\frac{dv_1}{dt}$ and $\frac{dv_2}{dt}$ at $t = 0^+$. **(10 Marks)**

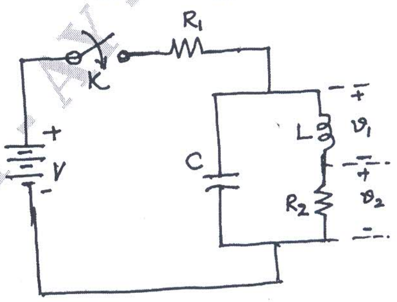

Fig.Q5(a)

b. Fig.Q5(b) shows a RLC series circuit excited by a dc voltage source. At t = 0 the switch K is closed. Find i(t). **(06 Marks)**

Fig.Q5(b)

OR

6 a. Fig.Q6(a) shows a RLC parallel circuit excited by a dc current source. At t = 0, the switch 'K' is opened. Find V(t). **(08 Marks)**

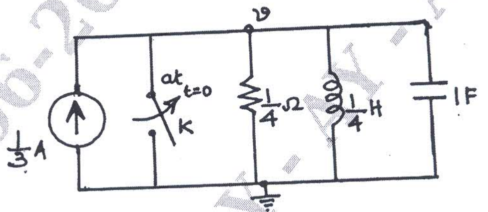

Fig.Q6(a)

b. The network shown in Fig.Q6(b) is in the steady state with the switch 'K' is closed. At t = 0, the switch is opened. Determine the voltage across the switch V_k and $\frac{dV_k}{dt}$ at $t = 0^+$.

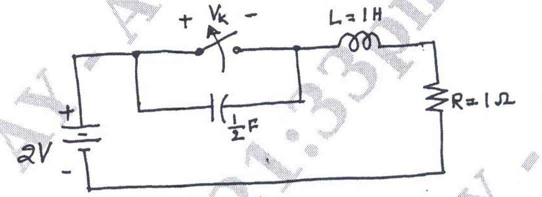

Fig.Q6(b) **(08 Marks)**

Module-4

7 a. In the RL series circuit shown in Fig.Q7(a), the switch K is closed at t = 0. Solve for the current i(t), using the Laplace transform method. **(08 Marks)**

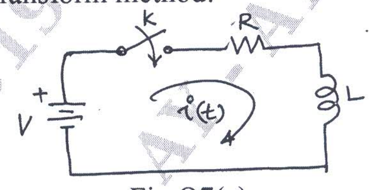

Fig.Q7(a)

b. State and prove (i) initial value theorem and (ii) final value theorem as applied to Laplace Transform. What are the limitations of each theorem? **(08 Marks)**

OR

8 a. Find the Laplace transform of the periodic sawtooth wave shown in Fig.Q8(a). **(08 Marks)**

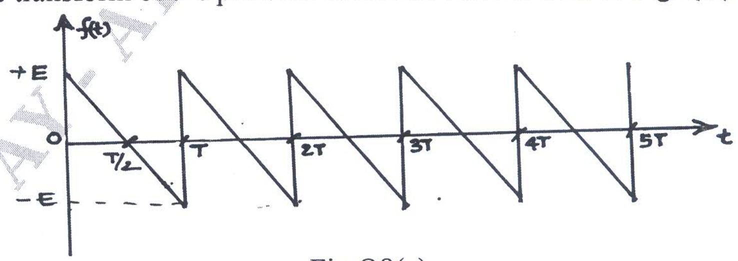

Fig.Q8(a)

b. The waveform shown in the Fig.Q8(b) is non-recurring. Write an equation for this waveform v(t). **(08 Marks)**

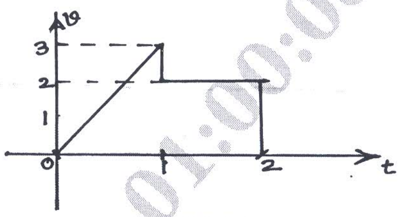

Fig.Q8(b)

Module-5

9 a. Find the Z-parameters for the circuit shown in Fig.Q9(a). Draw the Z-parameters equivalent circuit and find whether the network is (i) reciprocal and (ii) symmetrical. **(08 Marks)**

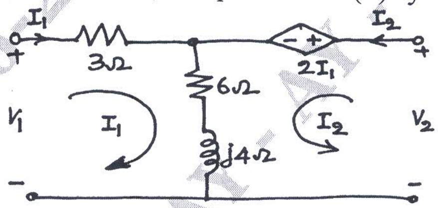

Fig.Q9(a)

b. For the RC network shown in Fig.Q9(b), find the driving point input impedance Z_{11}. Plot the pole-zero plot of this network function. **(08 Marks)**

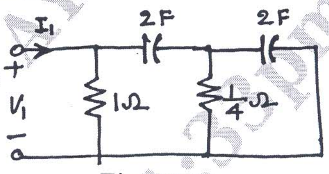

Fig.Q9(b)

OR

10 a. Find the (i) Phase currents (ii) Line currents (iii) Total active and reactive power for the three phase load shown in Fig.Q10(a). Draw the phasor diagram showing all the voltages and currents. Take V_{ac} as reference phasor. acb is the phase sequence and line voltage is 100 V. **(08 Marks)**

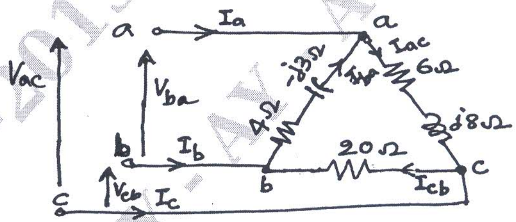

Fig.Q10(a)

b. A voltage wave $v = 141.4 \sin w_1t + 35.35 \sin(3w_1t + 30°) - 14.14\sin(5w_1t - 30°)$ is applied to the circuit shown in Fig.Q10(b). Find (i) Expression for current wave (ii) rms value of current and (iii) total power dissipated in the circuit. The reactances shown in Fig.Q10(b) are for fundamental frequency. **(08 Marks)**

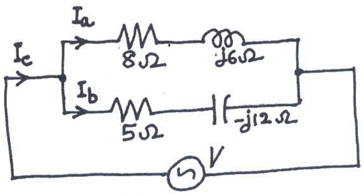

Fig.Q10(b)

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