CBCS SCHEME

USN [| | | | | | | | |] **17EC35**

Third Semester B.E. Degree Examination, June/July 2023

Network Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Find the equivalent resistance at AB using Y - Δ transformation technique for the circuit shown in Fig.Q1(a). **(06 Marks)**

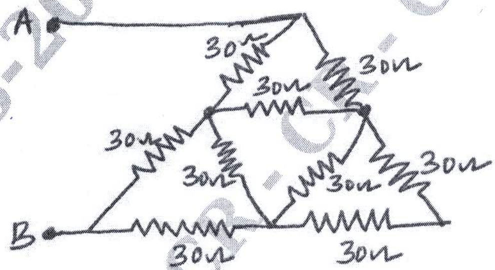


Fig.Q1(a)

b. Using source transformation, reduce the following network shown in Fig.Q1(b) into a single source with series resistance. **(06 Marks)**

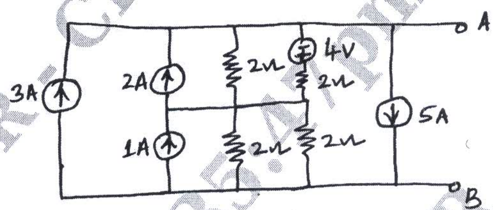


Fig.Q1(b)

c. Define and distinguish the following network elements :
i) Linear and no-linear
ii) Active and passive
iii) Lumped and distributed
iv) Ideal and practical current sources. **(08 Marks)**

OR

2 a. Write the mesh equations for the circuit shown in Fig.Q2(a) and determine mesh currents using mesh analysis.

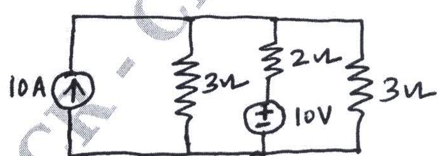


Fig.Q2(a) **(06 Marks)**

b. Find the power dissipated in 10Ω resistor by node voltage method in Fig.Q2(b).

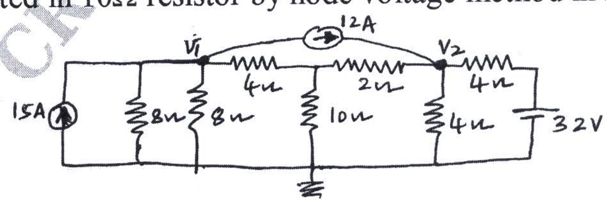


Fig.Q2(b) **(10 Marks)**

c. Explain the concept of Supermesh with example. **(04 Marks)**

Module-2

3 a. State and prove Reciprocity theorem. **(04 Marks)**

b. Using Superposition theorem, find I_x of the network shown in Fig.Q3(b).

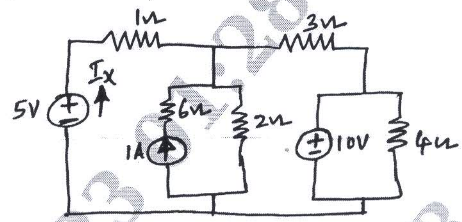


Fig.Q3(b) **(08 Marks)**

c. Using Millman's theorem, find current through the load resistor R_L for the circuit shown in Fig.Q3(c).

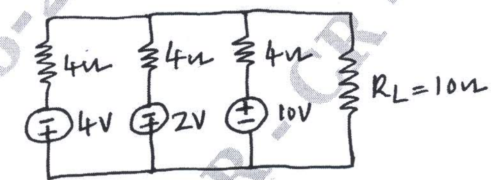


Fig.Q3 (c) **(08 Marks)**

OR

4 a. For the networks shown in Fig.Q4(a), obtain the Thevenin's equivalent as seen from the terminals A and B.

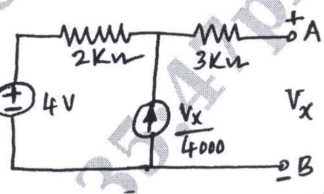


Fig.Q4(a) **(08 Marks)**

b. For the network shown in Fig.Q4(b), determine the impedance Z_x such that maximum power is transformed from the source to the load of impedance Z_x.

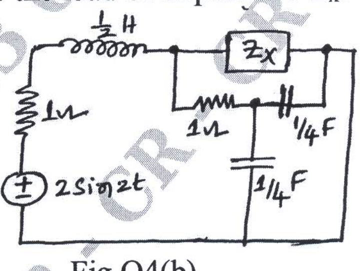


Fig.Q4(b) **(06 Marks)**

c. Using Norton's theorem, find the current 'I' for the networks shown in Fig.Q4(c).

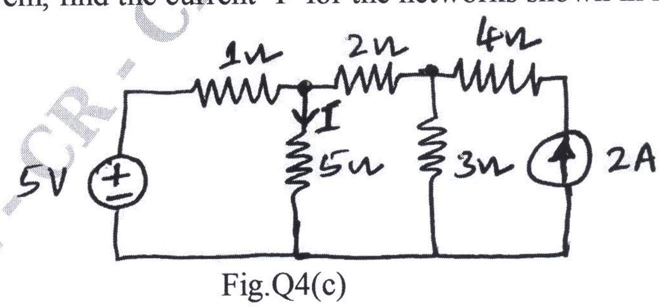


Fig.Q4(c) **(06 Marks)**

Module-3

5 a. What is Initial and Final condition? Explain the behavior of R, L and C for the initial condition. **(04 Marks)**

b. In the network shown in Fig.Q5(b), the switch is closed at t = 0. Determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

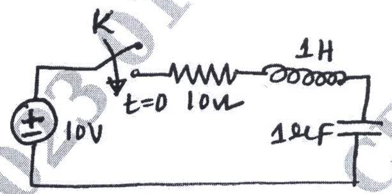


Fig.Q5(b) **(08 Marks)**

c. In the network shown in Fig.Q5(c), 'K' is changed form position 'a' to 'b' at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$, if R = 1000Ω , L = 1H and C = 0.1μF and V = 100V. Assume that the capacitor is initially unchanged.

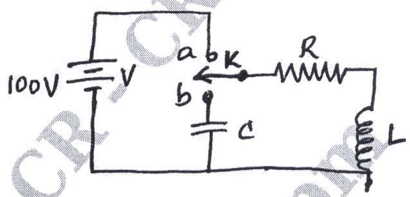


Fig.Q5(c) **(08 Marks)**

OR

6 a. Assuming that the staircase waveform of Fig.Q6(a) is not repeated, find its Laplace transform. If this voltage wave is applied to a RL series circuit with R = 1Ω and L = 1H, find the current i(t).

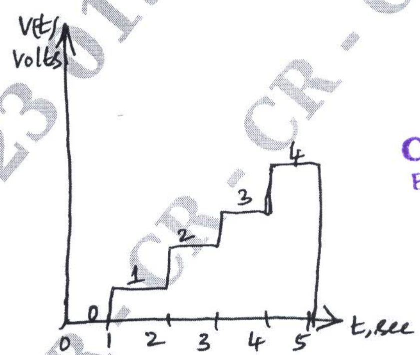


Fig.Q6(a) **(10 Marks)**

b. Find the Laplace transform of the given function $f(t) = 5 + 4e^{-2t}$. **(04 Marks)**

c. Find the Laplace transform of the saw tooth waveform in Fig.Q6(c).

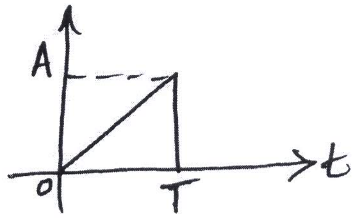


Fig.Q6(c) **(06 Marks)**

Module-4

7 a. Define Quality factor and Bandwidth. Also establish the relationship between Quality factor and Bandwidth in a series resonance circuit and there by prove that $Q = \frac{fo}{Bw}$, where fo is the resonance frequency. **(10 Marks)**

b. A series RLC circuit has $R = 10\Omega$, $L = 0.01H$ and $Q = 0.01\ \mu F$ and it is connected across 10mV supply. Calculate i) f_o ; ii) Q_o ; iii) Bandwidth ; iv) f_1 and f_2 ; v) I_o. **(10 Marks)**

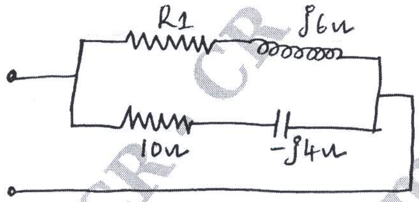
OR

8 a. Define the following terms with reference to resonant circuit :
i) Resonance ii) Q – factor iii) Selectivity iv) Bandwidth. **(06 Marks)**

b. Derive an expression for the resonant frequency of a parallel resonant circuit. Also show that the circuit is resonant at all frequencies of $R_L = R_C = \sqrt{\frac{L}{C}}$, where R_L = Resistance in the inductor branch , R_C = Resistance in the capacitor branch. **(08 Marks)**

c. Find the value of R_1 such that the circuit given in Fig. Q8(c).

Fig.Q8(c)



(06 Marks)

Module-5

9 a. Find the 'Z' parameters of the circuit shown in Fig. Q9(a).

Fig.Q9(a)

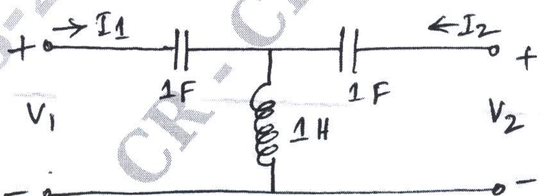
(10 Marks)

b. The Z – parameters of a two port network are $Z_{11} = 20\Omega$, $Z_{22} = 30\Omega$, $Z_{12} = Z_{21} = 10\Omega$. Find Y and ABCD parameters of the network **(10 Marks)**

OR

10 a. Obtain the h – parameters for the network shown in Fig. Q10(a). **(08 Marks)**

Fig.Q10(a)



b. Obtain Transmission parameters in terms of hybrid parameters. **(06 Marks)**

c. Following short circuit currents and voltages are obtained experimentally for a two port network :
i) With output short circuited : $I_1 = 5mA$; $I_2 = -0.3mA$ and $V_1 = 25V$.
ii) With input short circuited : $I_1 = -5mA$; $I_2 = 10mA$ and $V_2 = 30V$.
Determine Y – parameters. **(06 Marks)**

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