CBCS SCHEME

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18EC32

Third Semester B.E. Degree Examination, Dec.2024/Jan.2025
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. Define the following terms : (i) Network and Circuit (ii) Active and Passive circuits (iii) Mesh and Loop (iv) Node **(06 Marks)**

b. Reduce the circuit using source transformation technique for the circuit shown in Fig. Q1 (b). **(07 Marks)**

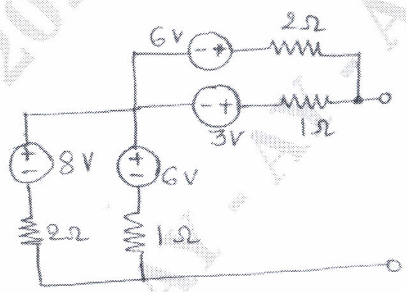

Fig. Q1 (b)

c. Find the voltage across capacitor using mesh analysis for the circuit shown in Fig. Q1 (c). **(07 Marks)**

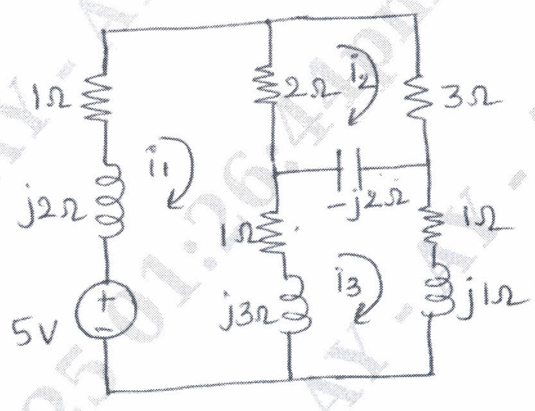

Fig. Q1 (c)

OR

2 a. Derive the expression for, (i) Δ to Y transformation (ii) Y to Δ transformation , Δ - delta, Y - Star **(10 Marks)**

b. Use the nodal analysis to find the value of V_x in the circuit shown in Fig. Q2 (b), such that the current through $(2+j3)\Omega$ is zero. **(10 Marks)**

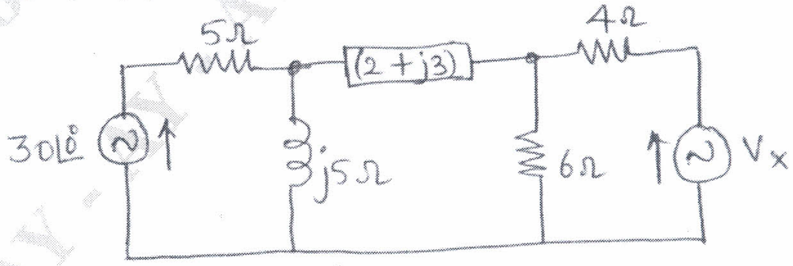

Fig. Q2 (b)

Module-2

3 a. State superposition theorem and hence obtain the response I for the network shown in Fig. Q3 (a).

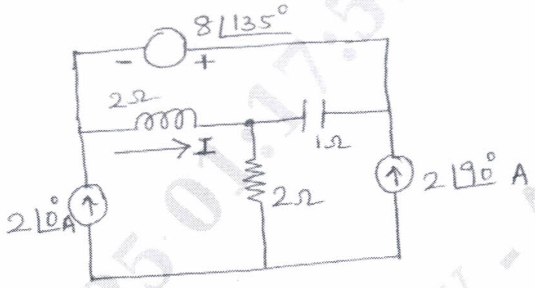

Fig. Q3 (a) **(12 Marks)**

b. State and prove Millman's theorem. **(08 Marks)**

OR

4 a. Obtain the Thevenin's and Norton's Equivalent circuit for the network shown in Fig. Q4 (a).

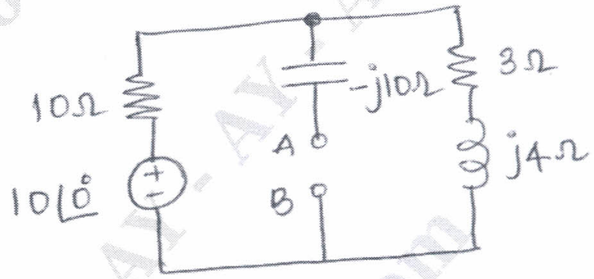

Fig. Q4 (a) **(08 Marks)**

b. State and prove Maximum power transfer theorem for AC circuits. **(06 Marks)**

c. Determine the Norton's Equivalent circuit across AB terminals and hence find current through 5Ω resistor for the network shown in Fig. Q4 (c). **(06 Marks)**

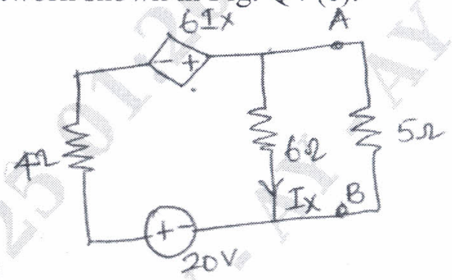

Fig. Q4 (c)

Module-3

5 a. Explain in detail the transient response of a R-L circuit for D.C. Excitation. **(10 Marks)**

b. Find i(t) for the network shown in Fig. Q5 (b), if the switch K is opened at t = 0, assume circuit was in steady state condition before the switch was opened at t = 0. **(10 Marks)**

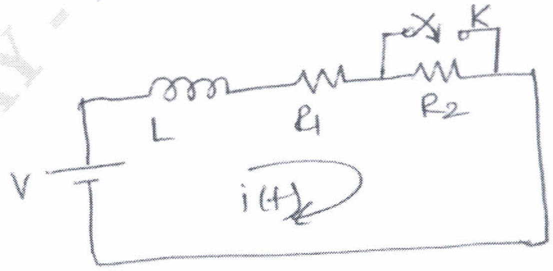

Fig. Q5 (b)

OR

6 a. Explain in detail the transient response of R-C circuit for A.C. Excitation. **(10 Marks)**

b. Determine $i(0^+)$, $\frac{di(0^+)}{dt}$, $\frac{d^2i(0^+)}{dt^2}$ if switch K is closed at t = 0 for the circuit shown in Fig. Q6 (b). Given V = 10 V, R = 10 Ω, L = 1 H, C = 10 μF and $V_C = 0$. **(10 Marks)**

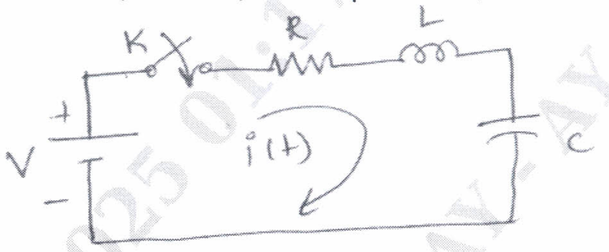

Fig. Q6 (b)

Module-4

7 a. State and prove initial value and final value theorem. **(10 Marks)**

b. Find the Laplace transform of waveform shown in Fig. Q7 (b). **(10 Marks)**

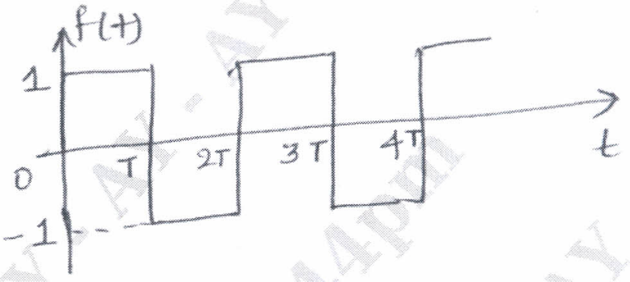

Fig. Q7 (b)

OR

8 a. Obtain the Laplace transform of, (i) Step (ii) Ramp (iii) Sinωt **(10 Marks)**

b. Find the Equivalent impedance of the circuit shown in Fig. Q8 (b), using Laplace transform.

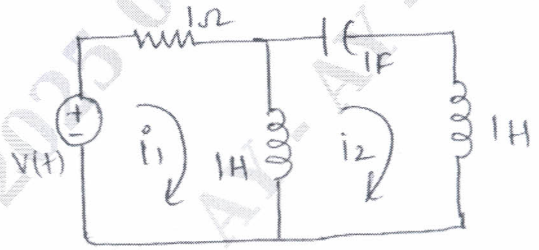

Fig. Q8 (b) **(10 Marks)**

Module-5

9 a. Define resonant frequency, half power frequencies with respect to series circuit and hence show that resonant frequency is geometric mean of half power frequencies. **(08 Marks)**

b. A coil of inductance 10H and 10Ω resistance is connected in parallel with 100 PF capacitor. The combination is applied with a voltage of 100 V. Find resonant frequency and current at resonance. **(06 Marks)**

c. A series RLC circuit consists of a resistance of 1 KΩ and an inductance of 100 mH in series with capacitor of 10 PF. If 100 V is applied as input across the combination determine resonant frequency, Max-current, Q-factor. **(06 Marks)**

OR

10 a. Explain z and y parameters with equivalent circuit and also express z-parameters in terms of y-parameters. **(08 Marks)**

b. Find the transmission parameters for the circuit shown in Fig. Q10 (b).

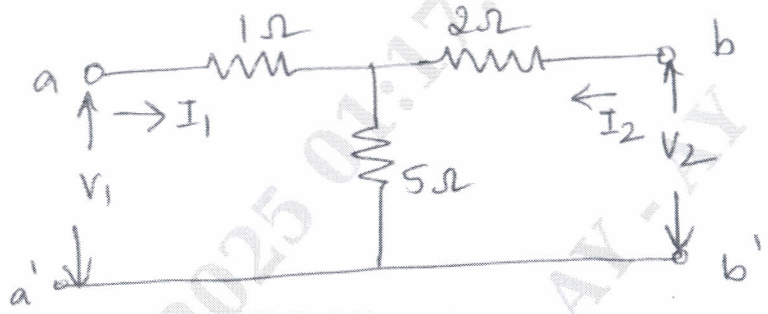

Fig. Q10 (b) **(06 Marks)**

c. Define Q-factor, Selectivity, Bandwidth and hence derive the relation between resonant frequency and half power frequencies. **(06 Marks)**

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