



Third Semester B.E. Degree Examination, Dec.2024/Jan.2025

Network Theory

Max. Marks: 100

Time: 3 hrs

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)

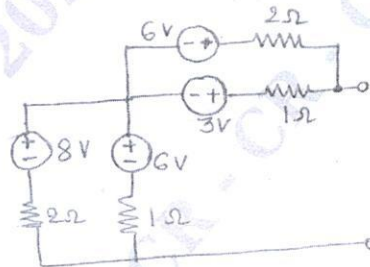


Fig. Q1 (b)

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

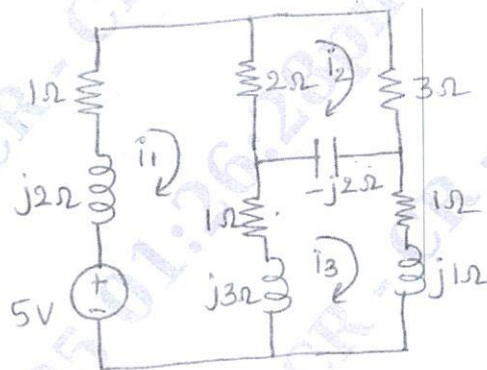


Fig. Q1 (c)

OR

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

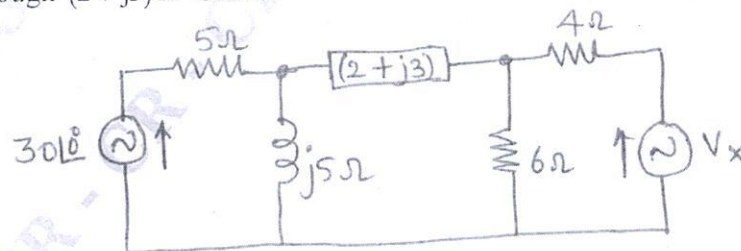


Fig. Q2 (b)

Module-2

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

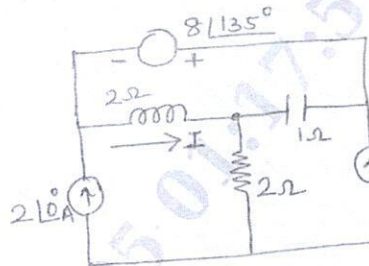


Fig. Q3 (a)

(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).

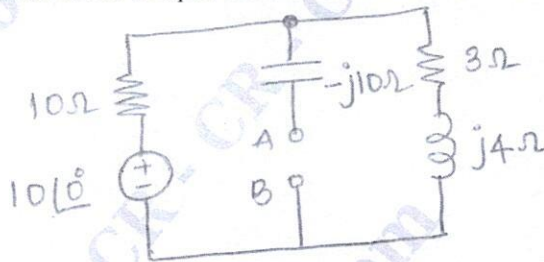


Fig. Q4 (a)

(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)

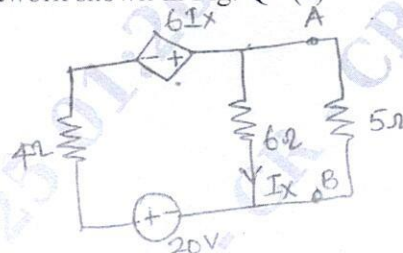


Fig. Q4 (c)

CMRIT LIBRARY
BANGALORE - 560 037

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)

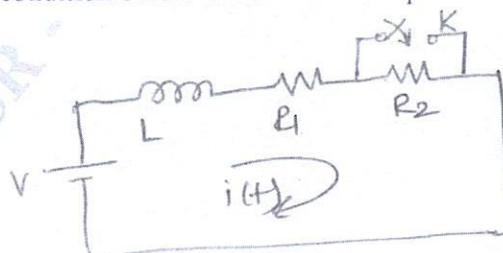


Fig. Q5 (b)

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 $V = 10\text{ V}$, $R = 10\ \Omega$, $L = 1\text{ H}$, $C = 10\ \mu\text{F}$ and $V_C = 0$. (10 Marks)

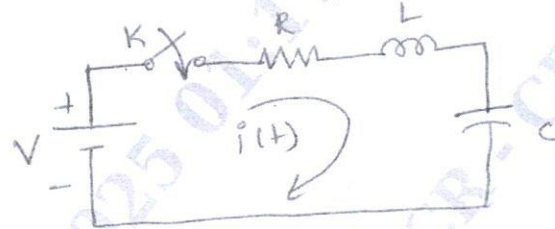


Fig. Q6 (b)

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)

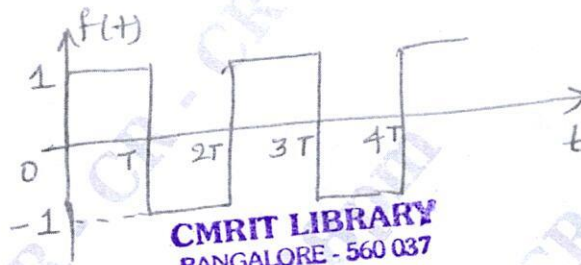


Fig. Q7 (b)

OR

- 8 a. Obtain the Laplace transform of, (i) Step (ii) Ramp (iii) $\sin \omega t$ (10 Marks)
- b. Find the Equivalent impedance of the circuit shown in Fig. Q8 (b), using Laplace transform.

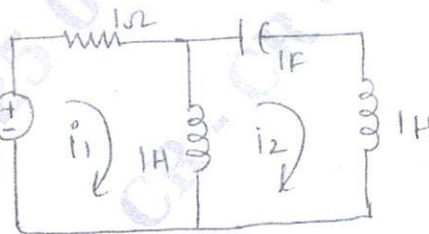


Fig. Q8 (b)

(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 10 Ω 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 K Ω 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).

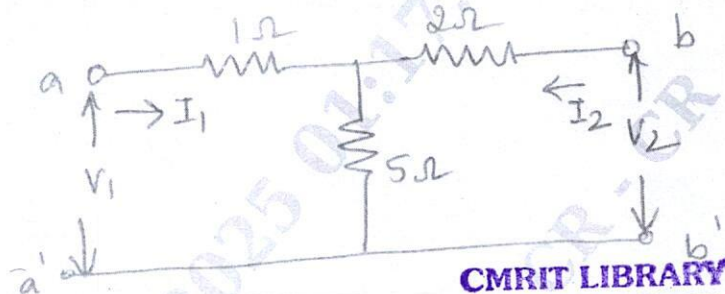


Fig. Q10 (b)

CMRIT LIBRARY
BANGALORE - 560 037

(06 Marks)

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

* * * * *