CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Three impedances are connected in delta. Obtain expressions for their star connected equivalent. **(06 Marks)**

b. Reduce the network shown in Fig.Q.1(b) to a single voltage source in series with a resistance using source shift and source transformations. **(06 Marks)**

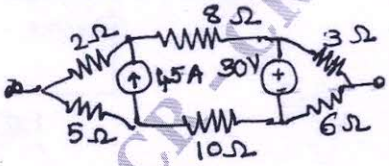

Fig.Q.1(b)

c. In the circuit shown in Fig.Q.1(c), determine V_2 which result in zero current through 4Ω resistor use mesh current analysis. **(08 Marks)**

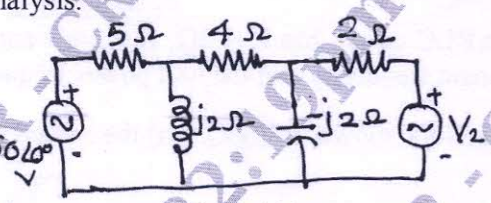

Fig.Q.1(c)

OR

2 a. Write short note on the following:
i) Active and Passive elements.
ii) Concept of Ideal and practical sources. **(06 Marks)**

b. Find the current I in 28Ω resistor by Mesh analysis in Fig.Q.2(b). **(07 Marks)**

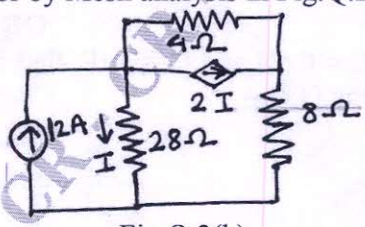

Fig.Q.2(b)

c. Find the power dissipated in 10Ω resistor by node voltage method in Fig.Q.2(c). **(07 Marks)**

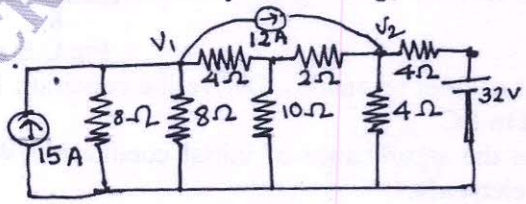

Fig.Q.2(c)

Module-2

3 a. State and explain superposition theorem. **(06 Marks)**

b. State and explain Reciprocity theorem. **(06 Marks)**

c. Find the value of R_L shown in Fig.Q.3(c) at which maximum power is transferred across ab. What is the maximum power transferred? **(08 Marks)**

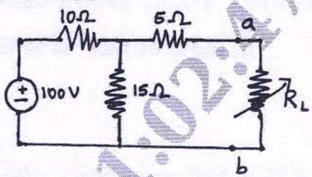

Fig.Q.3(c)

OR

4 a. State and prove the maximum power transfer theorem, for ac networks. **(07 Marks)**

b. Find the Thevenin's equivalent circuit of the network shown in Fig.Q.4(b) across load.

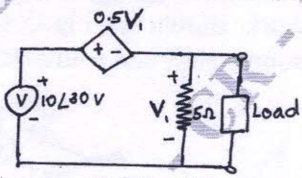

Fig.Q.4(b)

(07 Marks)

c. State and explain Norton's theorem. **(06 Marks)**

Module-3

5 a. A series RLC circuit has R = 2Ω, L = 2mH and C = 10μF. Calculate Q factor, band width, the resonant frequency and the half power frequencies. **(10 Marks)**

b. In the network shown in Fig.Q.5(b) the switch is closed at t = 0. Determine i, di/dt and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(10 Marks)**

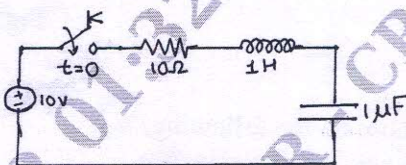

Fig.Q.5(b)

OR

6 a. If R = 25Ω, L = 0.5H and C = 5μF, find the W_{ar}, Q and the band width for the circuit as shown in the Fig.Q.6(a). **(08 Marks)**

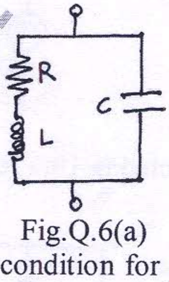

Fig.Q.6(a)

b. Explain parallel resonance. Derive the condition for parallel resonance when RL connected parallel to RC. **(06 Marks)**

c. What is the significance of initial conditions? Write a note on initial conditions in basic circuit elements. **(06 Marks)**

Module-4

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

b. Find the Laplace transformation of unit step, unit impulse and unit ramp function. **(10 Marks)**

OR

8 a. In the R.C. series circuit shown in Fig.Q.8(a) the switch is closed at t = 0, obtain the expression for the current. **(10 Marks)**

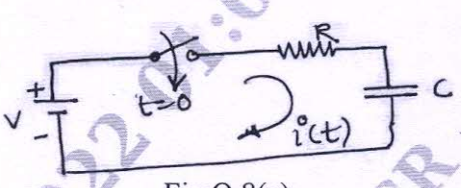

Fig.Q.8(a)

b. Find the inverse Laplace transform

i) $\frac{s^2+5}{s(s^2+4s+4)}$ ii) $\frac{2s+6}{s^2+6s+25}$ **(10 Marks)**

Module-5

9 a. A star load with $Z_A = (3 + j0)\Omega$, $Z_B = (2 + j3)\Omega$ and $Z_C = (2 - j1)\Omega$ is connected to 3 phase, 4 wire 100V system with the phase sequence as ACB. Find the line currents including the neutral. **(10 Marks)**

b. Find the transmission parameters for the circuit shown in Fig.Q.9(b). **(10 Marks)**

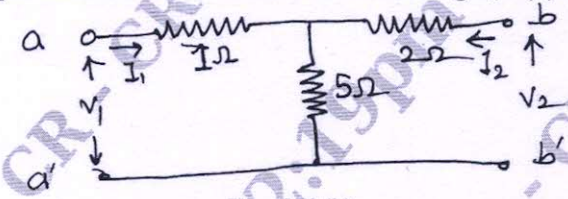

Fig.Q.9(b)

OR

10 a. For the networks shown in Fig.Q.10(a), find Z-parameters. **(10 Marks)**

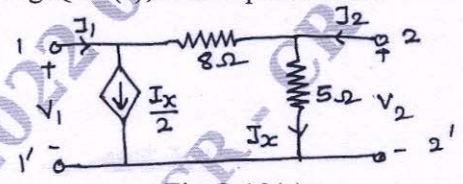

Fig.Q.10(a)

b. Determine the line currents and total power supplied to a delta connected load of $Z_{ab} = 10\ \angle 60°\Omega$, $Z_{bc} = 20\ \angle 90°\Omega$ and $Z_{ca} = 25\ \angle 30°\ \Omega$. Assume a 3-phase, 400V ABC system. **(10 Marks)**

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