

CBCS SCHEME



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17EC35

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 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. Calculate the current through 2Ω resistor in the network shown in Fig.Q1(a) by source transformation method.

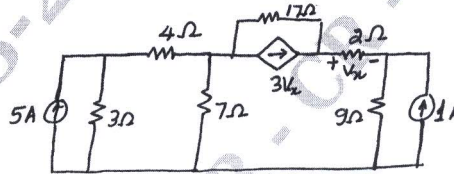


Fig.Q1(a)

(06 Marks)

- b. Use the nodal analysis to find the value of V_x in the circuit shown in Fig.Q1(b) such that the current through $(2 + j3)\Omega$ impedance is zero.

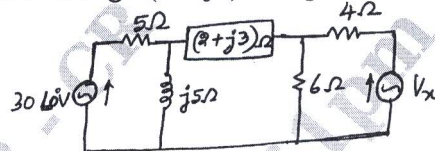


Fig.Q1(b)

(06 Marks)

- c. Obtain expressions to convert star connected impedances into equivalent delta connected impedances. (08 Marks)

OR

- 2 a. Find the power delivered by the dependent voltage source in the circuit shown in Fig.Q2(a) by mesh analysis.

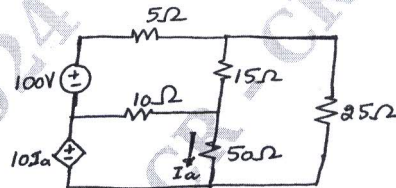


Fig.Q2(a)

(06 Marks)

- b. Explain the concept of super node and super mesh. (04 Marks)
c. Find the equivalent resistance R_{ab} for the circuit shown in Fig.Q2(b).

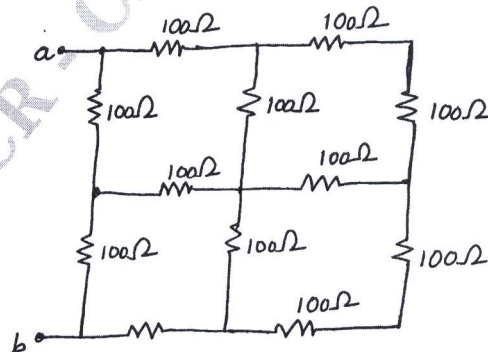


Fig.Q2(b)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-2

- 3 a. State and prove Thevenin's theorem. (08 Marks)
 b. Find the value of load resistance when maximum power is transferred across it and also find the value of maximum power transferred for the network of Fig.Q3(b).

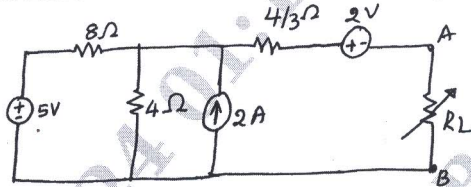


Fig.Q3(b)

(08 Marks)

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

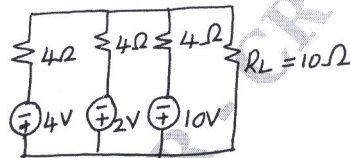


Fig.Q3(c)

(04 Marks)

OR

- 4 a. State and prove Reciprocity theorem. (08 Marks)
 b. Use superposition theorem to find I_0 in the circuit shown in Fig.Q4(b).

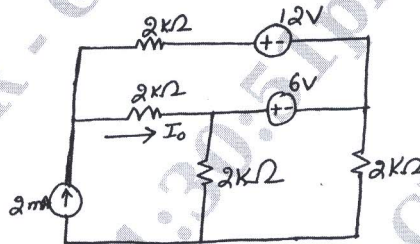


Fig.Q4(b)

(08 Marks)

- c. Find the Norton equivalent for the circuit of Fig.Q4(c).

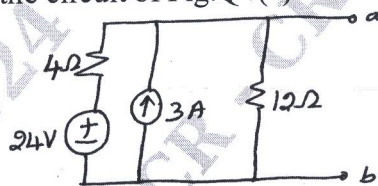


Fig.Q4(c)

(04 Marks)

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Module-3

- 5 a. What is significance of initial conditions? Write a note on initial conditions in basic circuit elements. (06 Marks)
 b. In the network shown in Fig.Q5(b), the switch is closed at $t = 0$. Determine i , di/dt and d^2i/dt^2 .

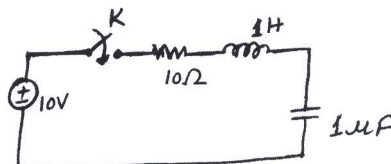


Fig.Q5(b)

(07 Marks)

- c. A series R – C branch with $R = 20\Omega$ and $C = 1 \mu\text{F}$ is shunted by an inductor of resistance 20Ω and inductance 1H . This is supported by a D.C. source of 100V through a series resistance of 10Ω . There is a switch across 10Ω which is closed at $t = 0$. Solve for the currents in L and C and their derivatives at $t = 0^+$. (07 Marks)

OR

- 6 a. Find the Laplace transforms of following standard functions:
 i) Step function ii) Ramp function iii) Impulse function. (06 Marks)
 b. Obtain the Laplace transform of the square wave train shown in Fig.Q6(b).

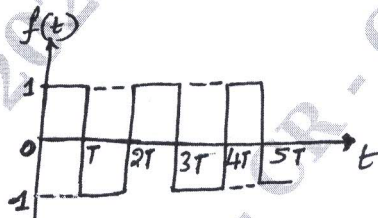


Fig.Q6(b)

(06 Marks)

- c. Find the inverse Laplace transform of $F(s) = \frac{s^2 + 3}{(s^2 + 2s + 5)(s + 2)}$. (08 Marks)

Module-4

- 7 a. Define: (i) Bandwidth (ii) Selectivity. Derive an expression for bandwidth for series resonant circuit. (08 Marks)
 b. For the parallel resonant circuit shown in Fig.Q7(b), find I_o , I_L , I_C , f_o and dynamic resistance.

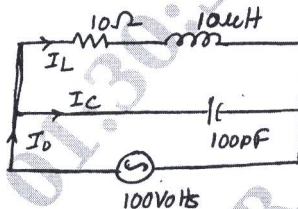


Fig.Q7(b)

(08 Marks)

- c. Find the resonant frequency in a series circuit having inductance of 50 mH and a condenser of $5 \mu\text{F}$. (04 Marks)

OR

- 8 a. A series RLC circuit has $R = 4\Omega$, $L = 1 \text{ mH}$ and $C = 10 \mu\text{F}$, calculate Q-factor, bandwidth resonant-frequency and the half power frequencies f_1 and f_2 . (08 Marks)
 b. Derive the expression for resonant frequency for the parallel circuit shown in the Fig.Q8(b).

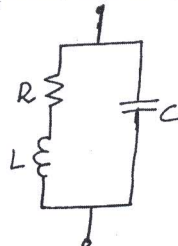


Fig.Q8(b)

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(08 Marks)

- c. Show that the resonant frequency is the geometric mean of two half power frequencies. (04 Marks)

Module-5

- 9 a. Define y and z-parameters. Derive relationship such that y-parameters expressed in terms of z-parameters expressed in terms of y-parameters. (12 Marks)
- b. Find the h-parameters for the two-port network shown in Fig.Q9(b).

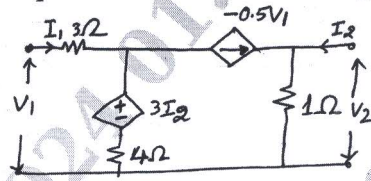


Fig.Q9(b)

(08 Marks)

OR

- 10 a. Express h-parameters in terms of z-parameters and establish the same. (08 Marks)
- b. Find out transmission parameters for the network shown in Fig.Q10(b).

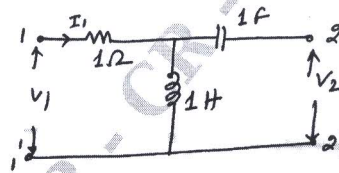


Fig.Q10(b)

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(08 Marks)

- c. Write the condition of symmetry and reciprocity for the following parameters:
- (i) Transmission parameters (ii) y-parameters. (04 Marks)
