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.

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-1

1 a. Calculate the current through 2Ω resistor in the network shown in Fig.Q1(a) by source transformation method.

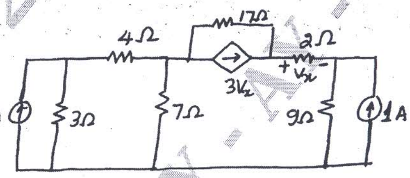

Fig.Q1(a) **(06 Marks)**

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.

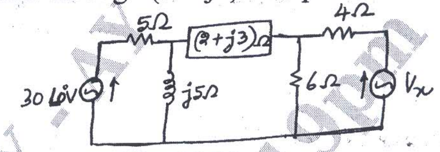

Fig.Q1(b) **(06 Marks)**

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.

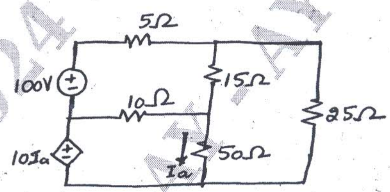

Fig.Q2(a) **(06 Marks)**

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).

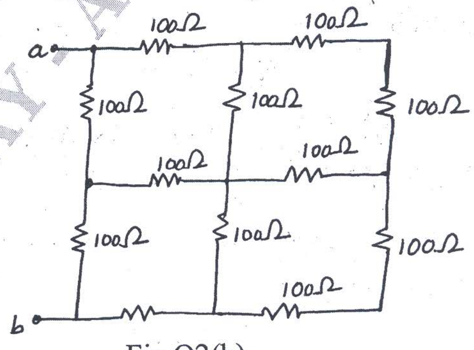

Fig.Q2(b) **(10 Marks)**

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).

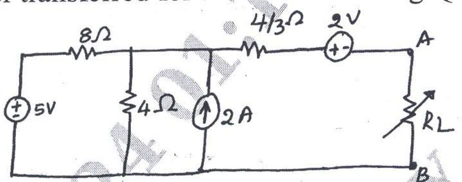

Fig.Q3(b) **(08 Marks)**

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

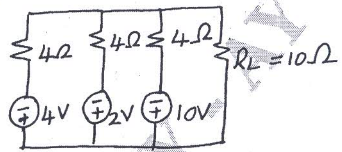

Fig.Q3(c) **(04 Marks)**

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).

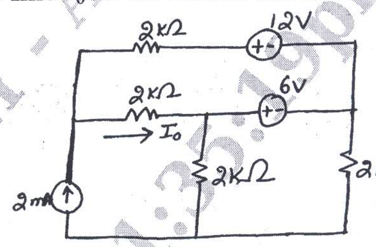

Fig.Q4(b) **(08 Marks)**

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

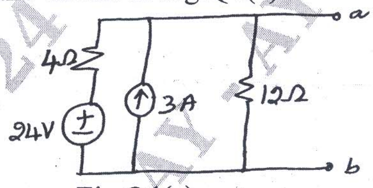

Fig.Q4(c) **(04 Marks)**

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.

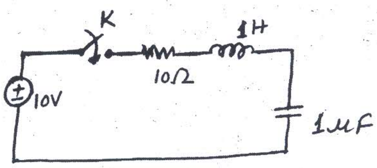

Fig.Q5(b) **(07 Marks)**

c. A series R – C branch with R = 20Ω and C = 1 μF is shunted by a 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 $r = 0^+$. **(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).

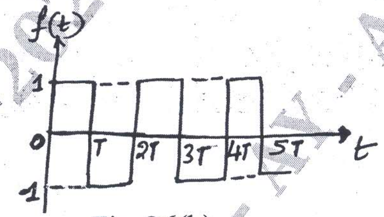

Fig.Q6(b) **(06 Marks)**

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 ad dynamic resistance.

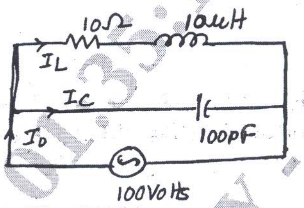

Fig.Q7(b) **(08 Marks)**

c. Find the resonant frequency in a series circuit having inductance of 50 mH and a condenser of 5 μF. **(04 Marks)**

OR

8 a. A series RLC circuit has R = 4Ω, L = 1 mH and C = 10 μF, 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).

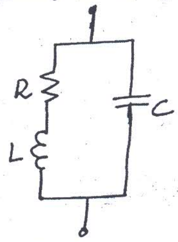

Fig.Q8(b) **(08 Marks)**

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 interms 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).

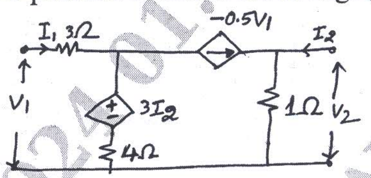

Fig.Q9(b) **(08 Marks)**

OR

10 a. Express h-parameters interms of z-parameters and establish the same. **(08 Marks)**

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

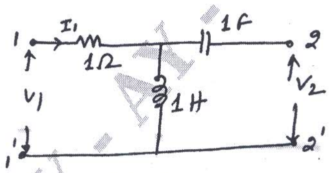

Fig.Q10(b) **(08 Marks)**

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

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