QP Code:EC2T03-1 **(Pages:4)**

Reg No : ..... Name : .....

MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM

(Govt. Aided Autonomous Institution)

Third Semester B.Tech. Degree (SAY) Examination, February, 2026

Course Code: B24EC2T03

Course Name: NETWORK THEORY

Max. Marks: 100 Duration:3 Hours

PART - A: 30 Marks (10 Qns x 3 Marks)

Answer all questions

1. A series RLC circuit consists of a 10 Ω resistor and a 60 mH inductor. If the circuit operates at 25 Hz with a power factor leading by 45°, determine the frequency at which the circuit will be in resonance.

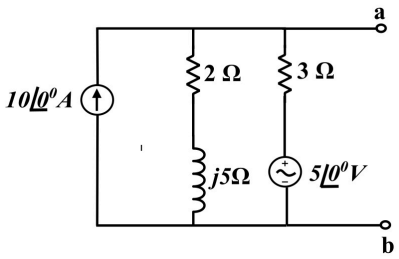
2. A network contains a current source common to two meshes. How is this handled in mesh analysis?

3. For the maximum power transfer, find the value of Z_L in the network shown for the following cases:

   a) Z_L is variable resistance

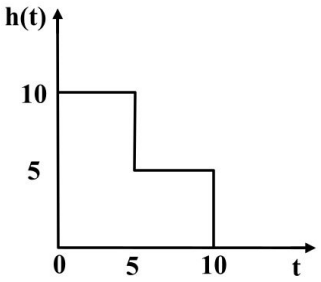
   b) Z_L is complex impedance, with variable resistance and variable reactance,

   c) Z_L is complex impedance with variable resistance and fixed reactance of j5Ω.



4. Superposition theorem is not applicable to networks containing nonlinear elements.Why?

5. Find the Laplace transform of the function *h(t)* shown in figure.



6. Derive the expression for the current in a series RC circuit when the input is a unit step signal of amplitude V?

7. Determine the time-domain response of the circuit when the pole lie on the left half of s-plane and right half of s-plane.

8. Obtain the pole-zero plot of the function. F(s) = $\frac{s(s+2)}{(s+1+j1)(s+1-j1)}$.

9. Draw the equivalent circuit of a two port network in terms of h-parameters.

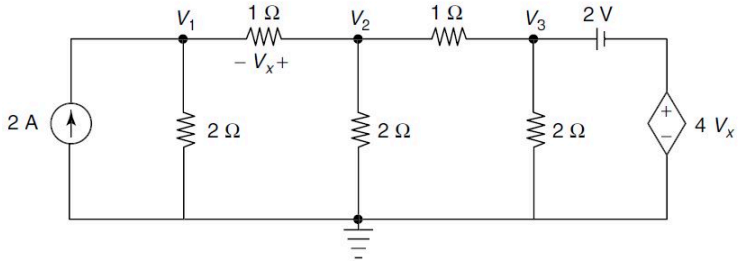
10. The h-parameter of a two port network is given as, h11= 25, h12=0.2, h21= 2, h22=0.04. Check whether the given network is symmetric?

PART - B: 70 Marks (5 Qns x 14 Marks)

Answer any One full question from each module.

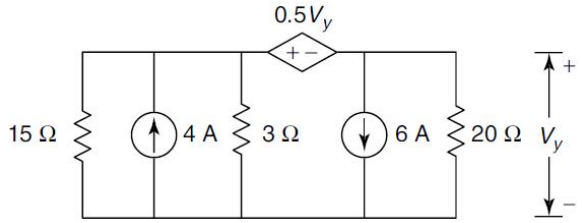
Module 1

11. Analyze the network to set up the node voltage equations and solve for V_1, V_2 and V_3.



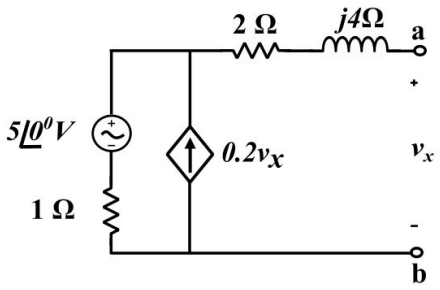
OR

12. Analyze the network to derive the equations needed to find V_y in the network shown.



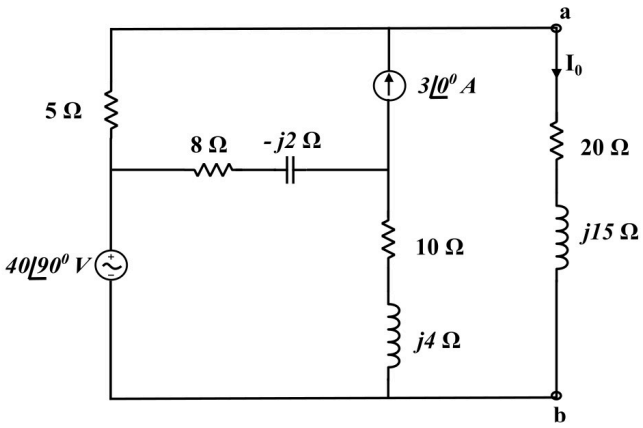
Module 2

13. Analyze the given network and determine the Thevenin equivalent across terminals *a* - *b*. Discuss how the equivalent circuit simplifies the analysis of connected loads.



OR

14. Evaluate the given circuit using Norton's theorem to determine I_0.

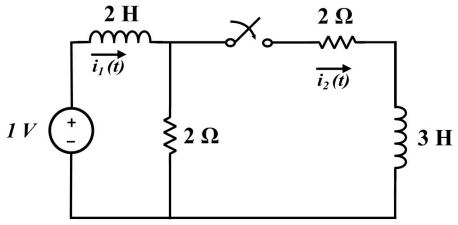


Module 3

15. Find the inverse Laplace transform of the transformed function
$F(s) = (s^2 - 15s - 11)/((s+1)(s-2)^2)$

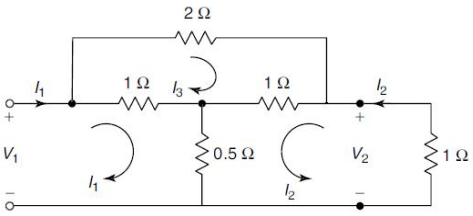
OR

16. In the network shown, the switch is closed at $t = 0$, the steady-state being reached before $t = 0$. Determine current through inductor of 3H.



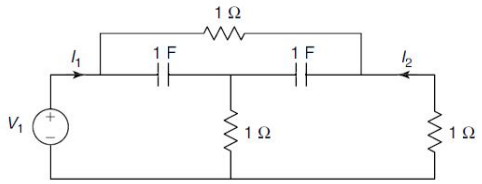
Module 4

17. For the resistive bridged T network shown, find V_2/V_1, V_2/I_1, I_2/V_1 and I_2/I_1.



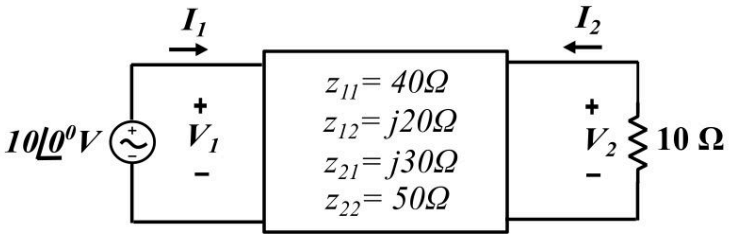
OR

18. For the network shown , find the driving-point admittance Y_{11} and transfer admittance Y_{12}.

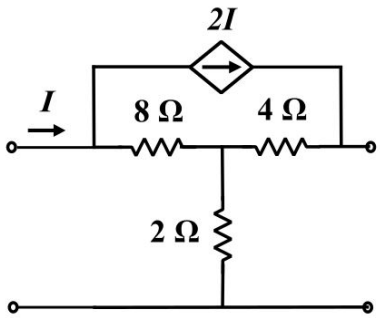


Module 5

19. a) Find I_1 and I_2 in the circuit shown. (4 marks)



b) Determine the Y parameters for the two-port shown. (10 marks)



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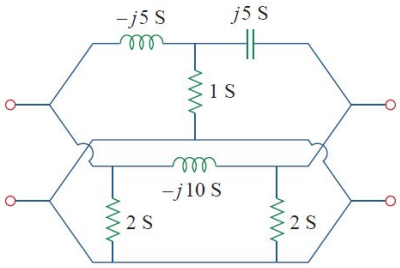
20. Analyze the two-port network to derive its Y-parameters.



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