Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (R, S) / S1 (PT)(S, FE) Examination December 2023 (2019 Scheme)

Course Code: ECT205

Course Name: NETWORK THEORY

Max. Marks: 100 Duration: 3 Hours

PART A

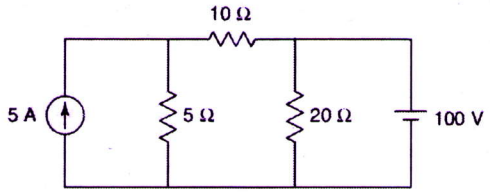
Answer all questions. Each question carries 3 marks Marks

1 Differentiate dependent and independent sources. (3)

2 Explain the concept of super-mesh with the help of a suitable example. (3)

3 State reciprocity theorem. (3)

4 Find the current through 20 Ω resistor using superposition theorem. (3)

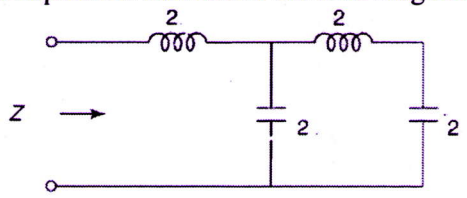


5 State the initial value theorem and find the initial value of the function, *f(t)* which have Laplace transform, $F(s) = \frac{s^2+1}{s(2s+3)(s+5)}$. (3)

6 Find the expression for the current through an *RC* circuit due to impulse as input. (3)

7 State the properties of a network transfer function. (3)

8 Find the driving point impedance function of the following network. (3)



9 Derive the conditions of reciprocity in a two-port network in terms of its transmission parameters. (3)

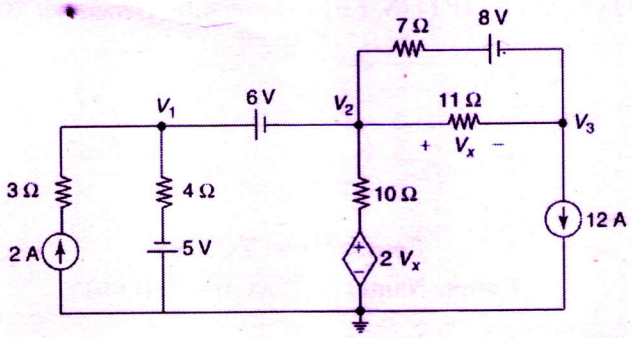
10 Consider a two-port network with the open circuit impedance parameter matrix $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$. Check whether the network is symmetric and reciprocal. (3)

PART B

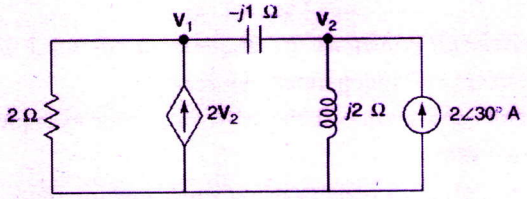
Answer any one full question from each module. Each question carries 14 marks

Module 1

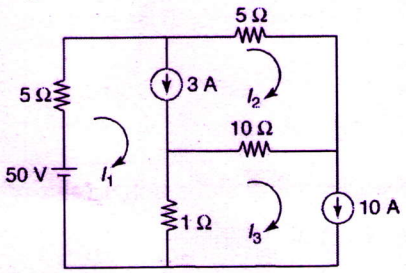
11 *a.* Using node analysis determine the voltage V_x. (8)



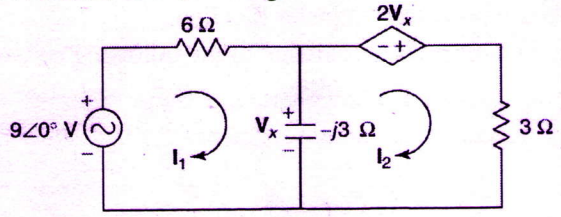
b. Find the node voltages of the following circuit. (6)



12 a. Find the current through 10 Ω resistor using mesh analysis. (6)

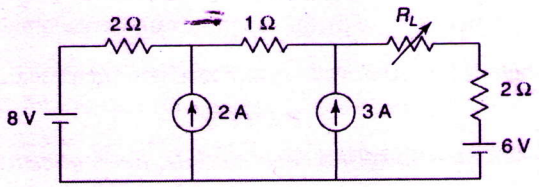


b. Find the loop current I_1 and I_2 in the given network. (8)

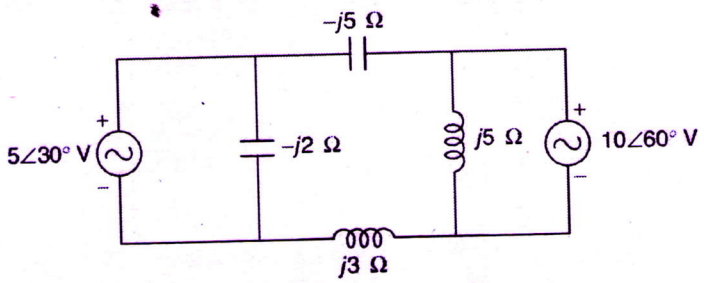


Module 2

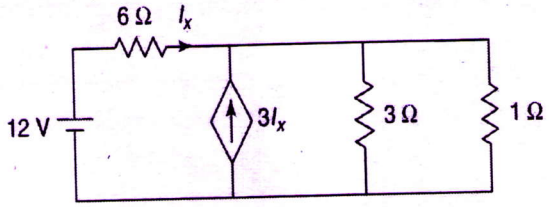
13 a. Find the value of R_L such that maximum power is transferred to it. Also find the maximum power transferred to R_L (7)



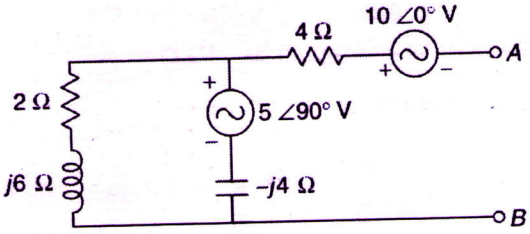
b. Find the current through $j3$ Ω using superposition theorem. (7)



14 a. Find the current through 1Ω resistor using Norton's method. (8)

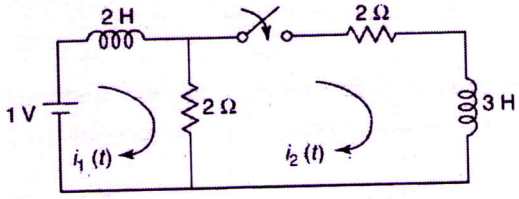


b. Obtain the Thevenin's equivalent of the network with respect to terminals *AB*. (6)



Module 3

15 a. In the circuit, the switch is closed at $t = 0$. Determine current through the inductor with inductance 3H for $t > 0$. Assume the steady state being reached before t = 0. (8)

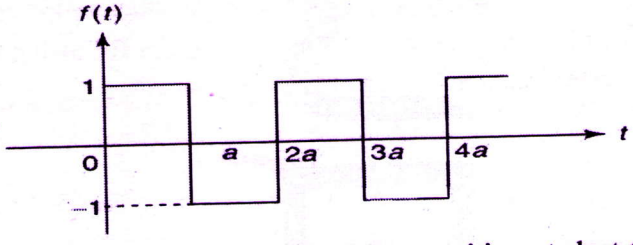


b. Find the Laplace transform of the following signals (6)

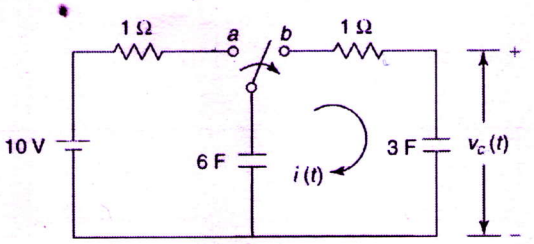
i) $\int_0^t e^{-4t} \sin 2t$

ii) $\frac{1-e^{-t}}{t}$

16 a. Find the Laplace transform of the waveform *f(t)*. (6)

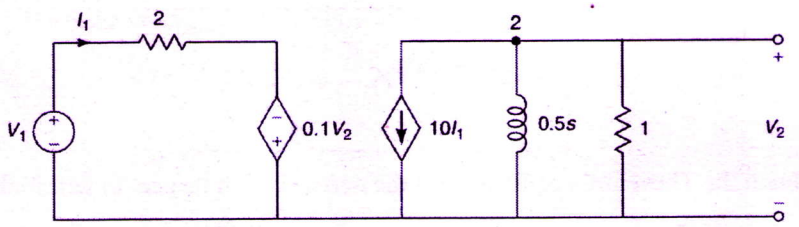


b. In the given network, the switch is moved from position a to b at $t = 0$. Determine the voltage, $V_C(t)$. (8)



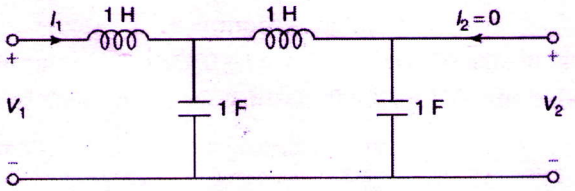
Module 4

17 a. Find the driving point admittance function, $Y_{11} = \frac{I_1}{V_1}$ of the following network. (6)



b. The voltage of a network is given as $V(s) = \frac{(s+2)(s+6)}{(s+1)(s+5)}$. Plot the pole-zero diagram and hence obtain $V(t)$. (8)

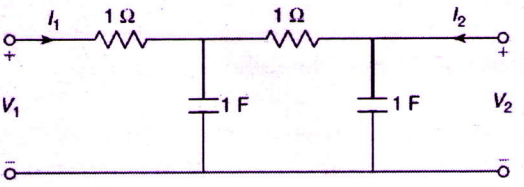
18 Find the network functions $\frac{V_1}{I_1}, \frac{V_2}{V_1}$ and $\frac{V_2}{I_1}$ of the following network. (14)



Module 5

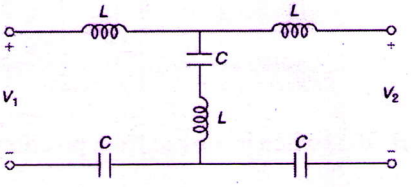
19 a. Express the transmission parameters in terms of Z-parameters and h-parameters. (7)

b. Determine the short circuit admittance parameters of the following network. (7)



20 a. Show that when 2 two-port networks are connected in series, the resultant Z-matrix is the sum of Z-matrices of each individual network. (6)

b. Find the open circuit impedance parameters of the following circuit using the concept of series interconnection of two-port networks. (8)



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