1T00833 - S.E.(Electrical Engineering)(SEM-III)(Choice Base Credit Grading System) (R- 19) (C Scheme) / 51022 - Electrical Circuit Analysis

QP CODE: 10037793 DATE: 23/11/2023

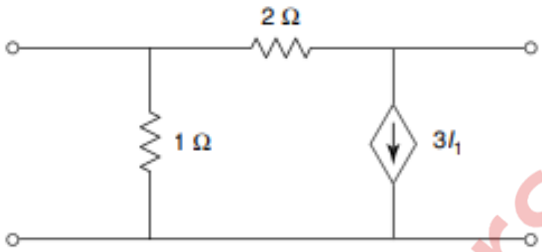
(3 Hours) **Total Marks: 80**

Note:

- Question No. 1 is compulsory.
- Answer any **three** from the remaining five questions.
- Assume suitable data if necessary and justify the same.

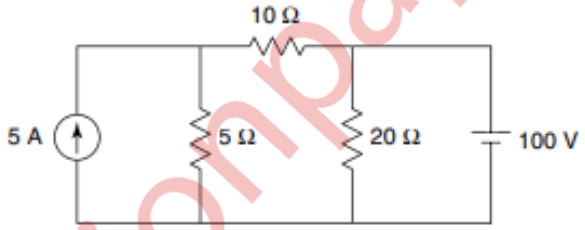
Q1 Each question carries five marks **20M**

a The open-circuit impedance matrix of the two-port network shown is

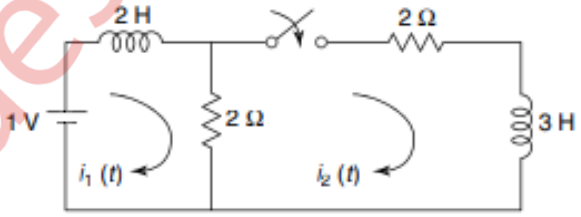


b The voltage V(s) of a network is given by $V(s)=\frac{3s}{(s+2)(s^2+2s+2)}$ Plot its pole-zero diagram

c Determine the current through the 20 ohm in the following circuit



d In the network shown, the switch is closed at t = 0, the steady-state being reached before t=0. Determine the current $i_1(0^+)$ and $i_2(0^+)$.



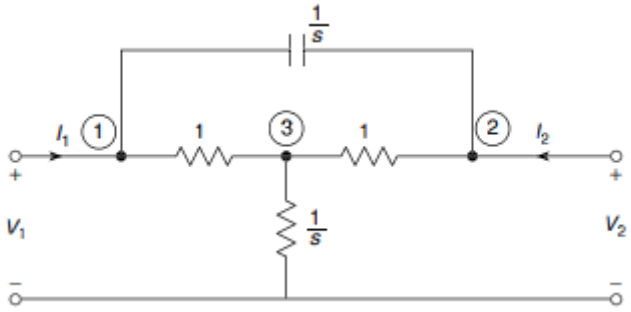
Q2 a The reduced incidence matrix of an oriented graph is **10M**

$$A=\begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

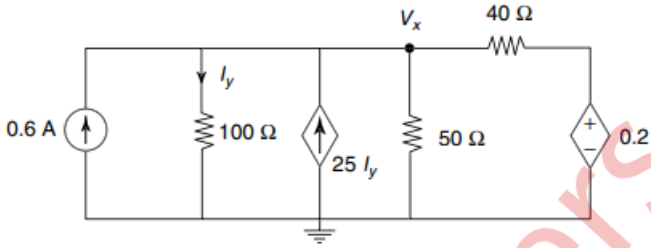
(a) Draw the graph. (b) How many trees are possible for this graph? (c) Write the tieset and cutset matrices.

b Derive the condition for reciprocity and symmetry for ABCD-parameters. **10M**

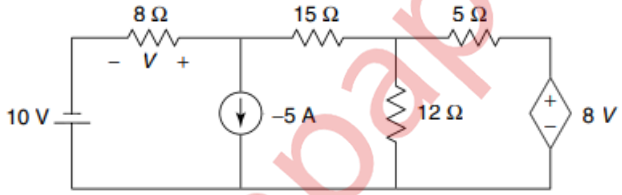
Q3 a Obtain Y-parameters of the network shown **10M**



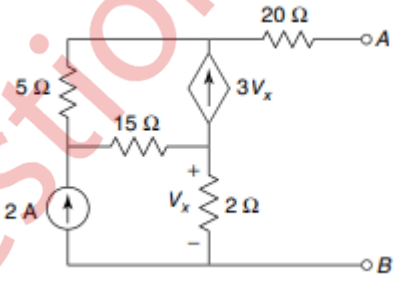
b Find the voltage V_x for the given network using nodal analysis. **10M**



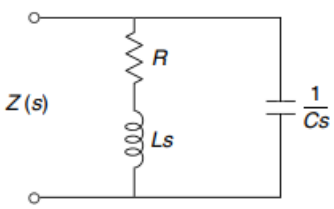
Q4 a Find the voltage V using superposition theorem. **10M**

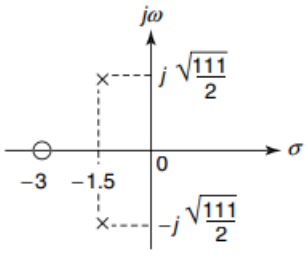


b For the given network, find Norton's equivalent network. **10M**

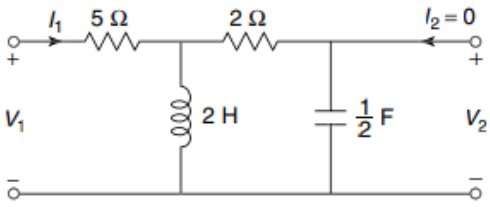


Q5 a A network and its pole-zero configuration are shown as follows. Determine the values of R, L and C if Z (j0) = 1. **10M**

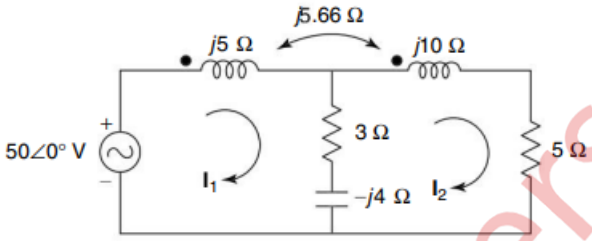




b Determine the driving-point impedance $\frac{V_1}{I_1}$, transfer impedance $\frac{V_2}{I_1}$, and voltage transfer ratio $\frac{V_2}{V_1}$, for the network shown **10M**



Q6 a Determine the voltage across the 5Ω resistor using mesh analysis. **10M**



b For the following network, steady state is reached with the switch closed. The switch is opened at t = 0. Obtain expressions for i_L (t) and v_L (t). **10M**