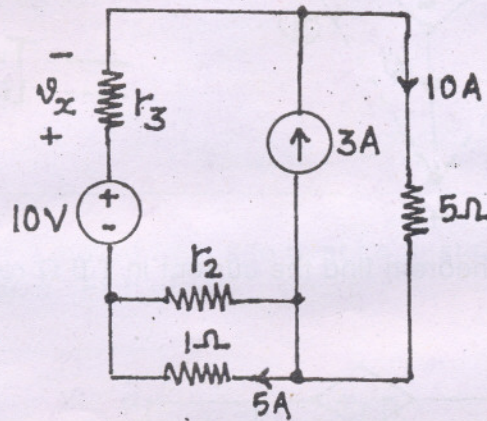


- N.B. (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** questions out of remaining **six** questions.  
 (3) In **all** solve **five** questions.

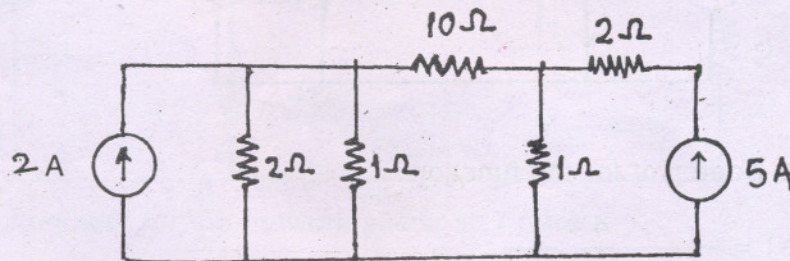
1. Solve all :

20

- (a) For the network shown determine  $v_x$ ,  $r_2$  and  $r_3$ .



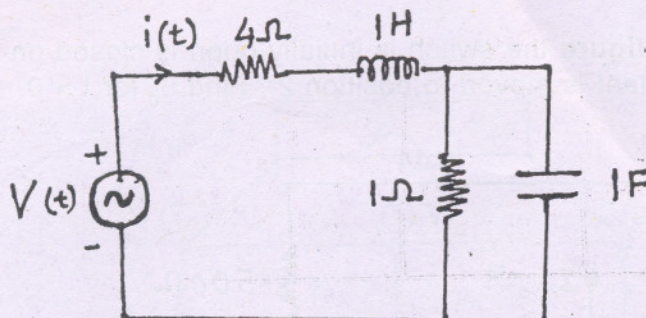
- (b) Using Thevenin's theorem, determine the power loss in the  $10\ \Omega$  resistor.



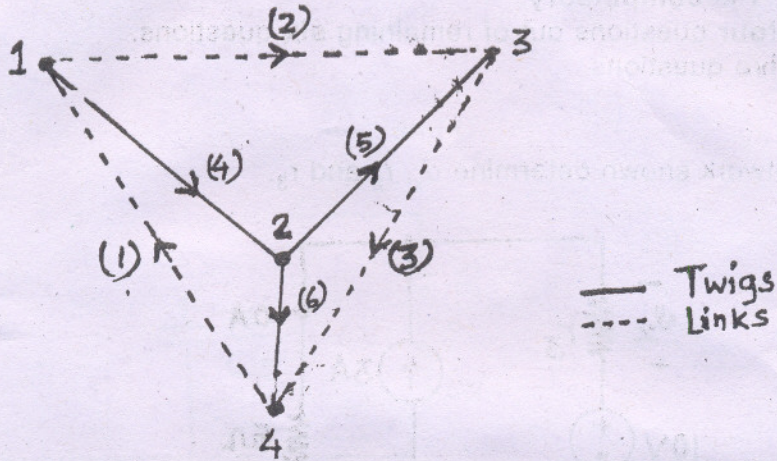
- (c) The reduced incidence matrix  $[A]$  of an oriented graph is,

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

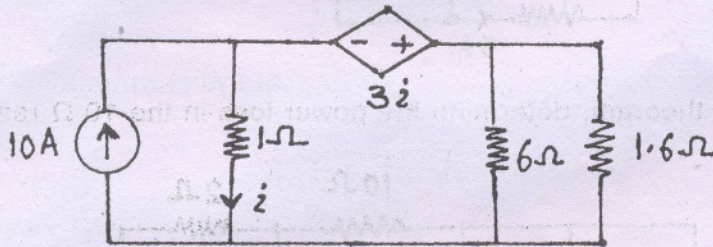
- (i) Draw the graph  
 (ii) How many trees are possible for this graph ?  
 (d) Obtain the pole zero plot of transfer impedance of the network shown in figure below :



2. (a) The oriented graph of a network is shown in figure. Write (i) incidence matrix (ii) f-Cutset matrix and (iii) f-Tieset matrix. 10



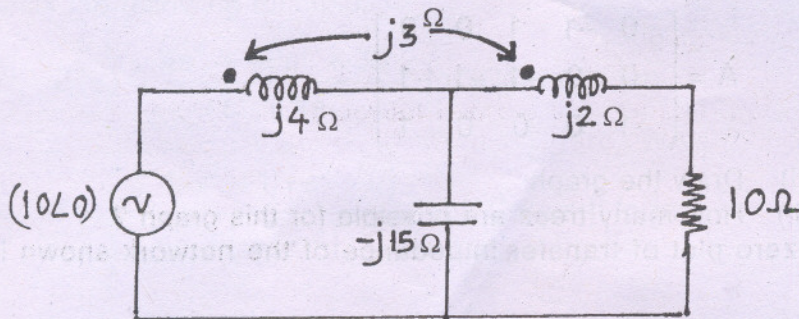
- (b) In the network, by Norton's theorem find the current in  $1.6 \Omega$  resistor. 10



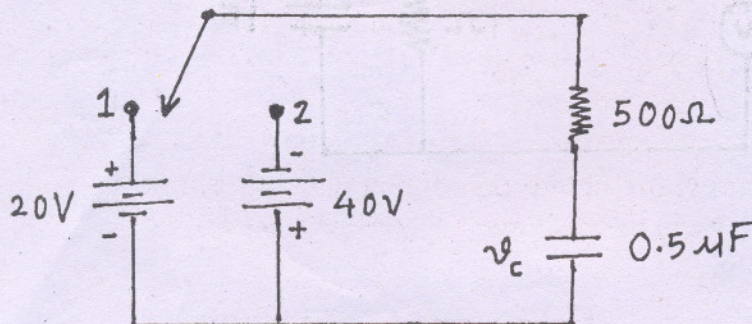
3. (a) Construct the Bode plot for the function 10

$$F(s) = \frac{4}{(1+s) \left(1 + \frac{s}{3}\right)^2}$$

- (b) Find the voltage across the  $10 \Omega$  resistor for the network shown in figure. 10

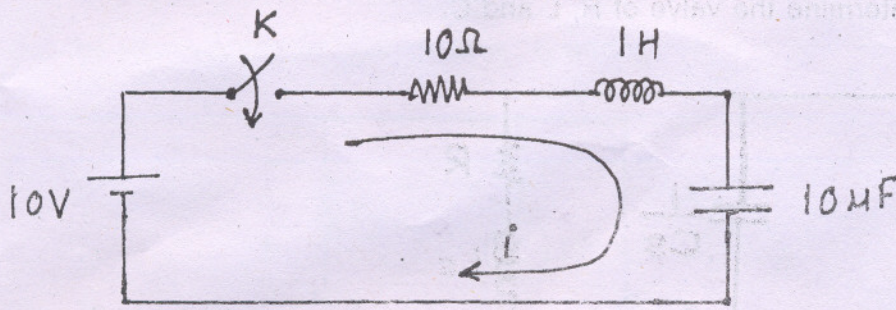


4. (a) In the RC circuit shown in figure the switch is initially open is closed on position 1 at  $t = 0$  and after 1 time constant is moved to position 2. Find  $v_c$  for  $t > 0$ . 10

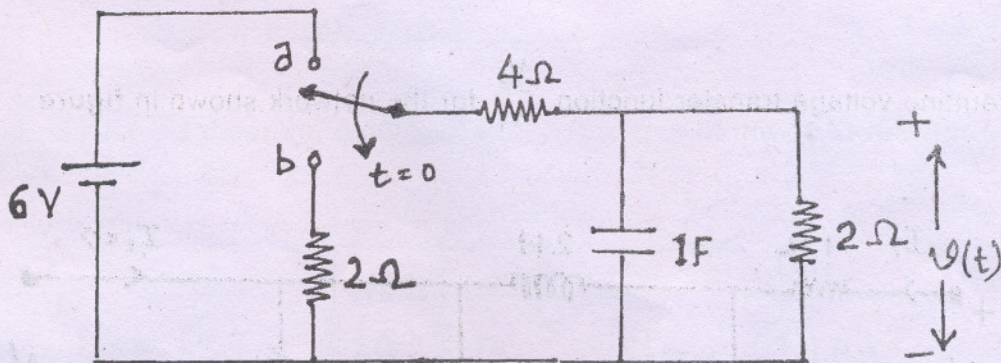


(b) In the network shown in figure, switch K is closed. Assuming all initial conditions zero, 10

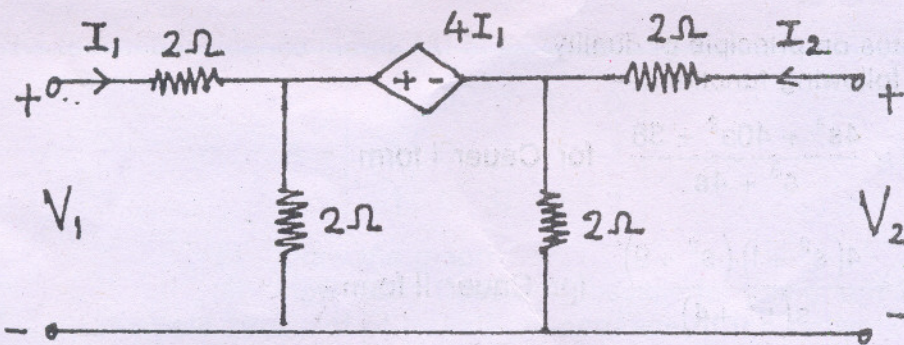
find  $i$ ,  $\frac{di}{dt}$  and  $\frac{d^2i}{dt^2}$  at  $t = 0^+$



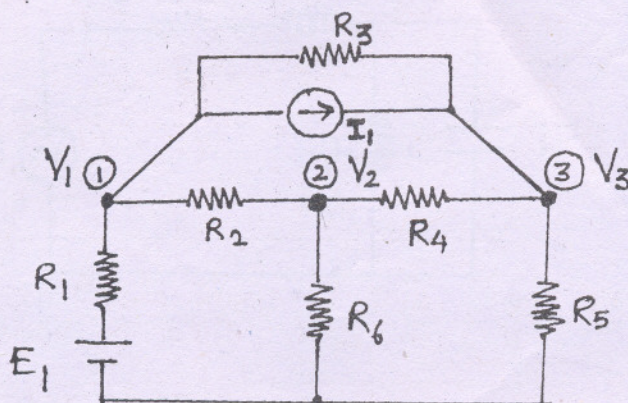
5. (a) In the network switch is moved from a to b, at  $t = 0$ , steady state conditions having been established in position a. Find  $v(t)$ . 10



(b) Find Z and h-parameters for the network shown in figure. 10



6. (a) Develop nodal equations in nodes (1), (2) and (3) in the circuit. 5

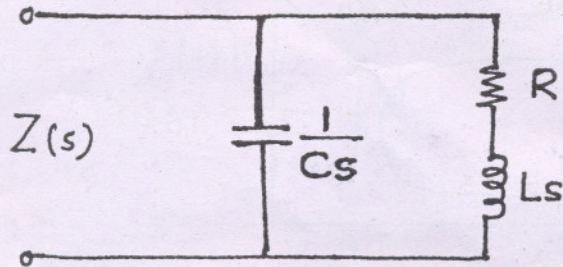


- (b) Explain the properties of positive real function (P.R.F.) with proper illustration. 5  
 (c) The network is shown in **figure**. The poles and zeros of the driving point function  $Z(s)$  of this network are at: 10

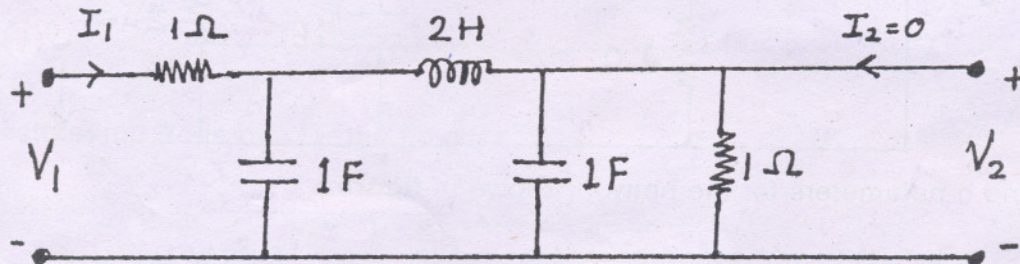
Poles at  $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$

Zeros at  $-1$

If  $Z(j0) = 1$ , determine the value of  $R$ ,  $L$  and  $C$ .



7. (a) Determine voltage transfer function  $\frac{V_2}{V_1}$  for the network shown in **figure**. 6



- (b) Write short notes on principle of duality.  
 (c) Synthesis the following functions—

(i)  $Z(s) = \frac{4s^4 + 40s^2 + 36}{s^3 + 4s}$  for Cauer I form

(ii)  $Z(s) = \frac{4(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$  for Cauer II form