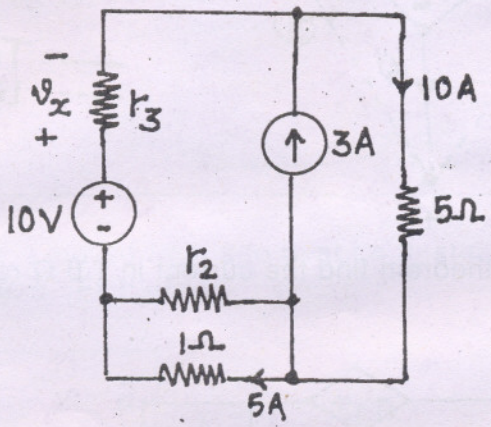
(3 Hours) **[Total Marks : 100**

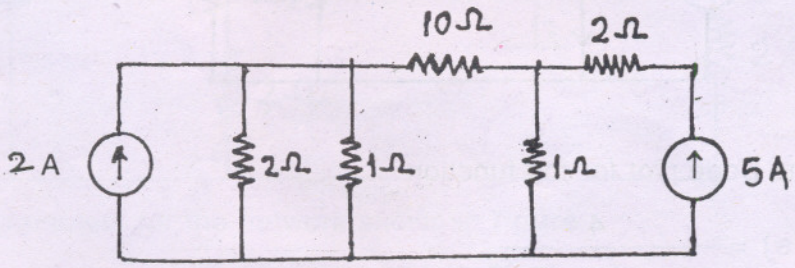
N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) In **all** solve **five** questions.

1. Solve all : 20

(a) For the network shown determine υ_x, r_2 and r_3.



(b) Using Thevenin's theorem, determine the power loss in the 10 Ω resistor.

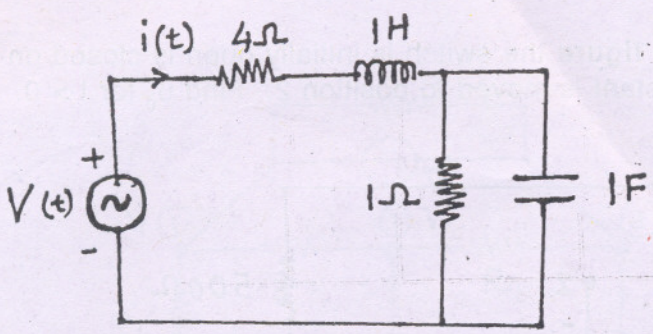


(c) The reduced incidance matrix [A] of an oriented graph is,

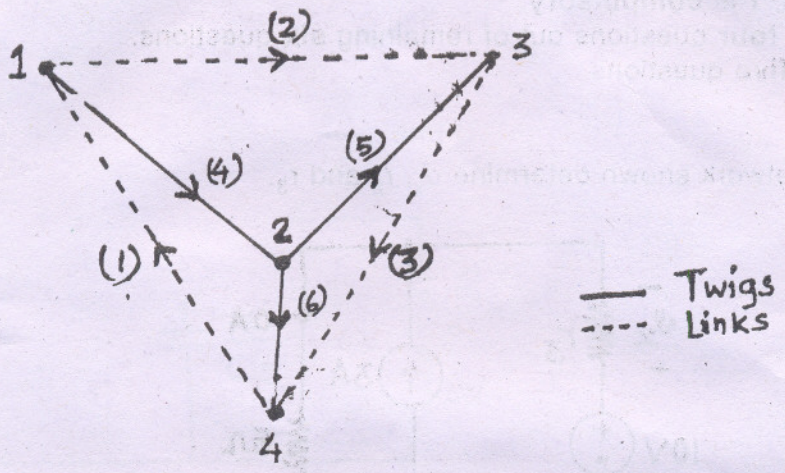
$$A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(i) Draw the graph
(ii) How many trees are possible for this graph ?

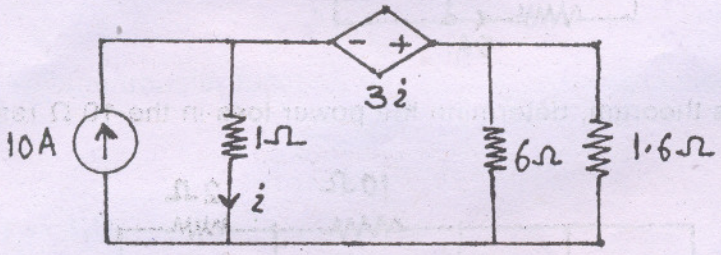
(d) Obtain the pole zero plot of transfer impedance of the network shown in **figure** below :



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



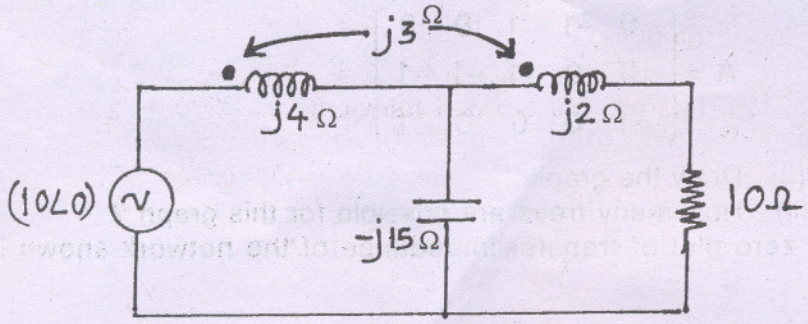
(b) In the network, by Norton's theorem find the current in 1·6 Ω resistor. 10



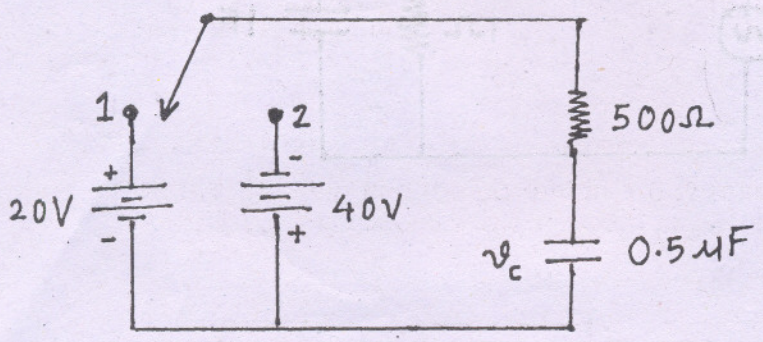
3. (a) Construct the Bode plot for the function 10

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

(b) Find the voltage across the 10 Ω resistor for the network shown in **figure**. 10

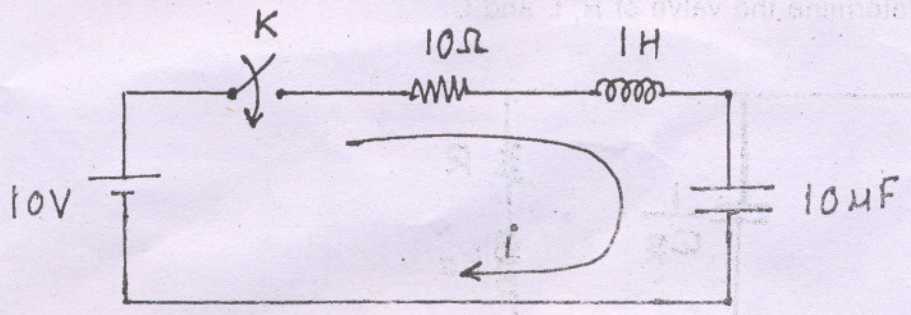


4. (a) In the RC circuit shown in **figure** the switch is initially open is closed on position 1 at t = 0 and after 1 time constant is moved to position 2. Find υ_c for t > 0. 10

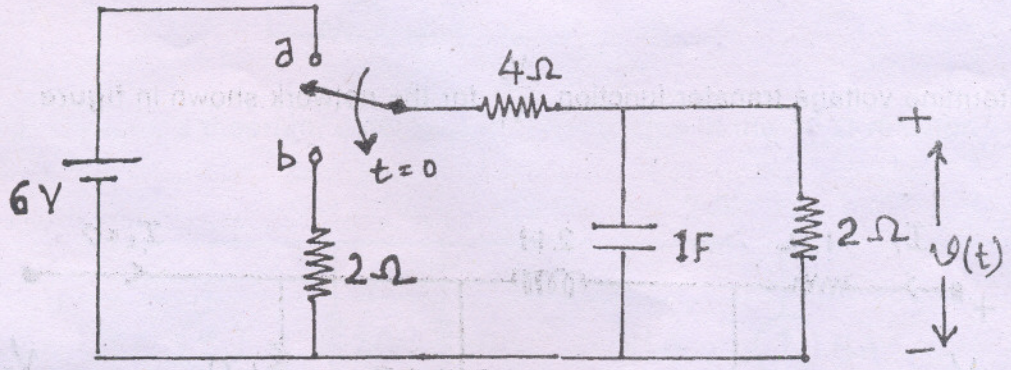


(b) In the network shown in **figure**, switch K is closed. Assuming all initial conditions zero, **10**

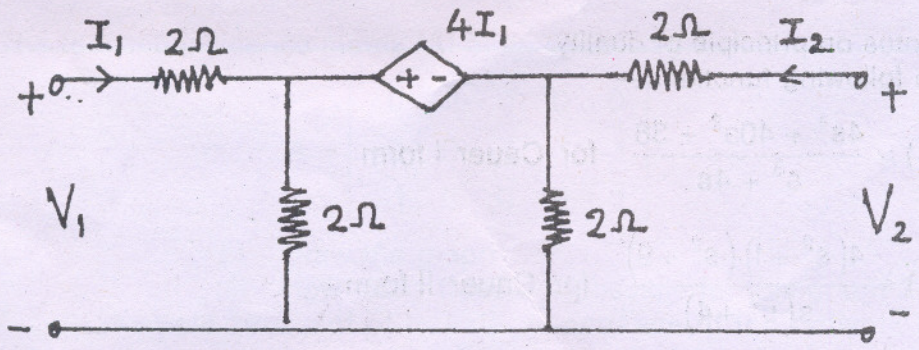
find $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$



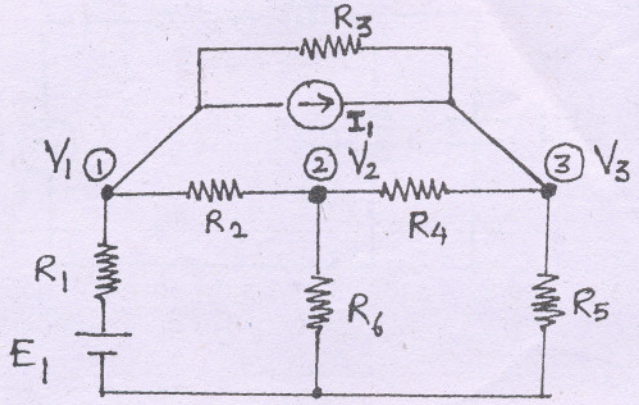
5. (a) In the network switch is moved from a to b, at t = 0, steady state conditions having been established in position a. Find $\upsilon(t)$. **10**



(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**



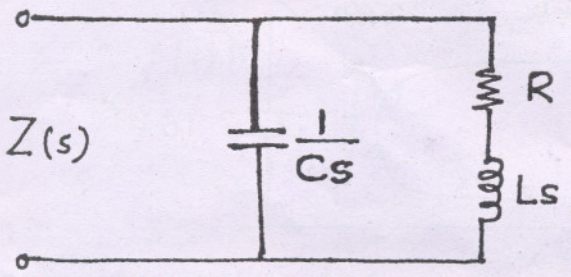
(b) Explain the properties of positive real function (P.R.F.) with proper illustration. 5

(c) The network is shown in **figure**. The poles and zeros of the driving point function Z(s) of this network are at : 10

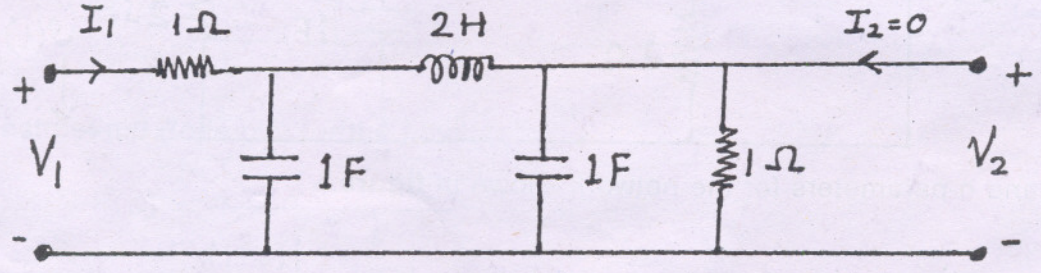
Poles at $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$

Zeros at – 1

If Z(j 0) = 1, determine the valve 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. 4

(c) Synthesis the following functions— 10

(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