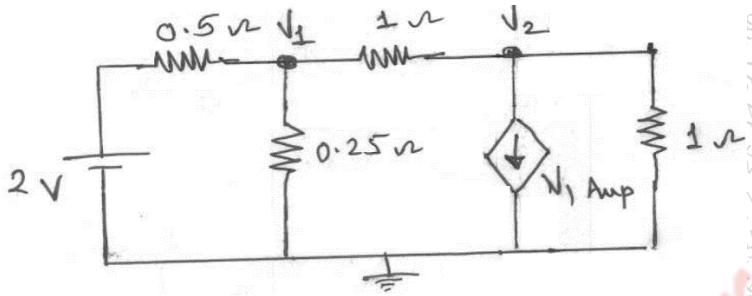
[Time: 3 Hours] **[Total Marks: 80]**

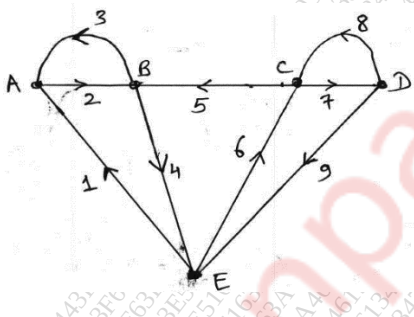
N.B.: 1. Question no.1 is compulsory.

2. Attempt any three from remaining 5 questions.

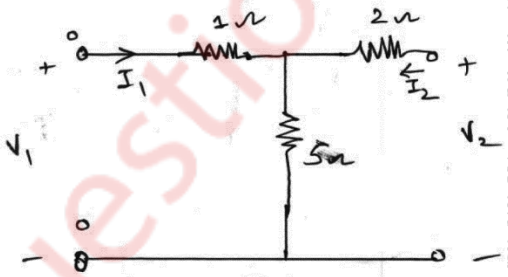
Q1 **a)** Determine the node voltages V1 and V2 by Nodal Analysis. **5**



b) Find incidence Matrix (A) for the graph shown in figure. **5**



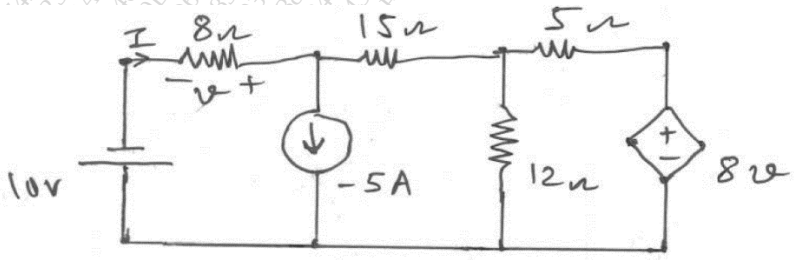
c) Find the transmission parameters [A, B, C, D] for the network shown in the fig. **5**



d) Test whether F(s) is a positive real function **5**

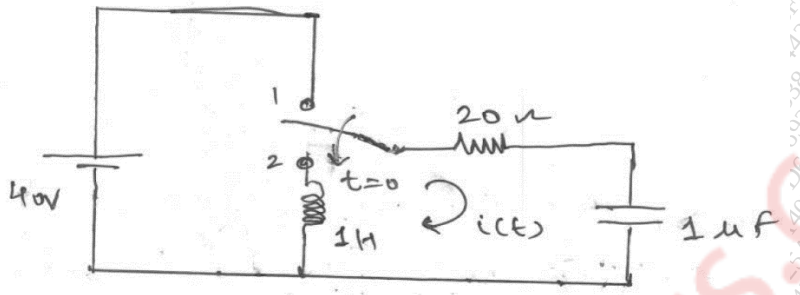
$$F(s) = \frac{s^3+6s^2+7s+3}{s^2+2s+1}$$

Q2 **a)** Find the current 'I' in 8Ω resistor by superposition theorem. **10**

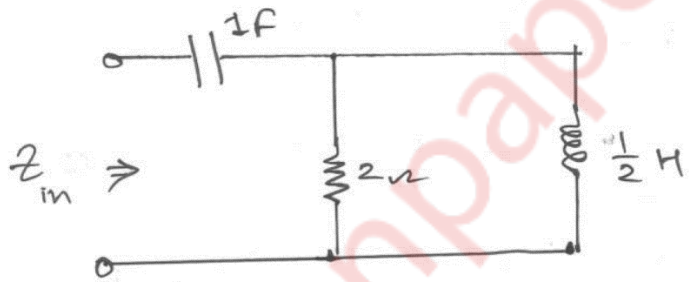


b) The switch in the circuit shown is charged from position '1' to position '2' at t=0. Steady state conditions having reached before switching. Find the values of **5**

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



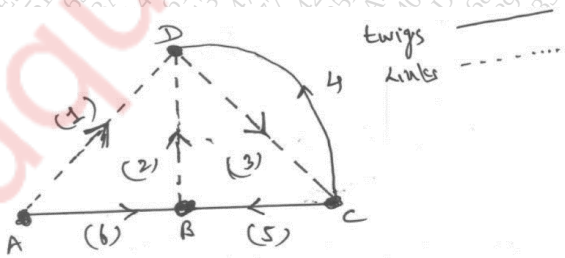
c) Determine the driving point impedance function $z_{in}(s)$ for the Network shown in fig. and also draw pole-zero plot. **5**



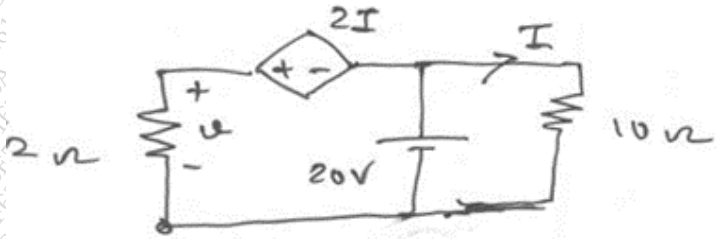
Q3 **a)** Synthesize z(s) into Foster -1 and cauer-1 forms. **10**

$$z(s) = \frac{s^2+12s^2+32s}{s^2+7s+6}$$

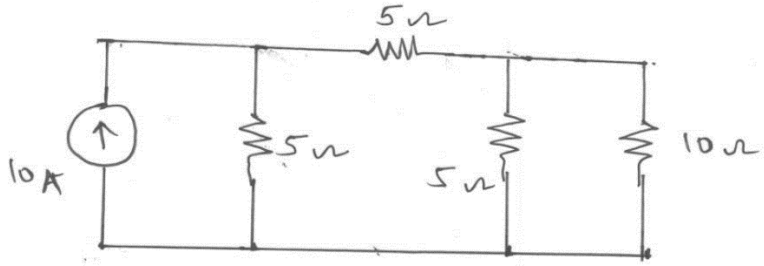
b) Determine f-loop matrix for the graph shown in fig. **5**



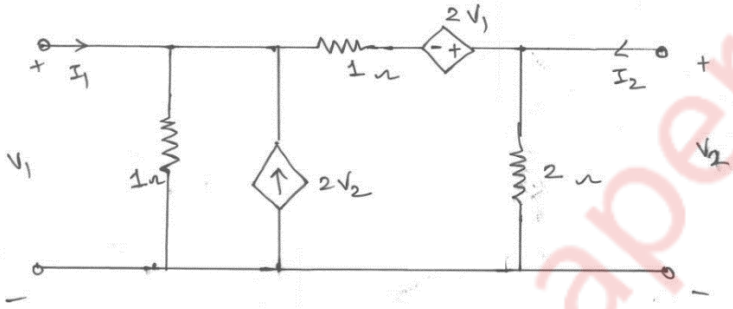
c) Find voltage across 2Ω resistor. **5**



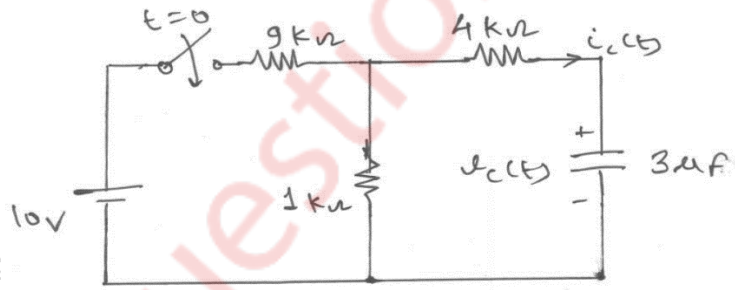
Q4 **a)** Write f-cut set matrix for the circuit shown and hence obtain matrix Node equation using Graph Theory. **10**



b) For the Network shown in the figure determine z and y parameters. **10**



Q5 **a)** In the figure shown the switch is closed at t=0 with no initial charge on the capacitor. Determine $v_c(t)$ and $i_c(t)$ for $t \geq 0$ **10**

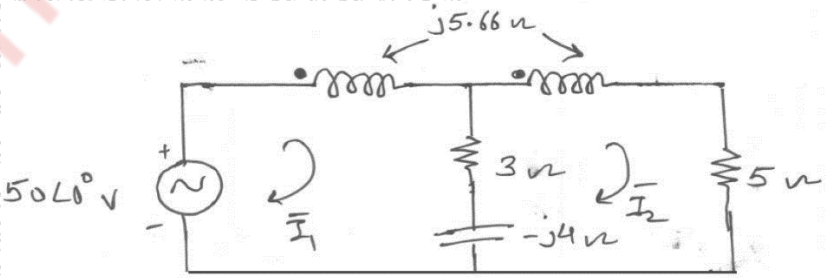


b) Test the following for Hurwitz polynomial **5**

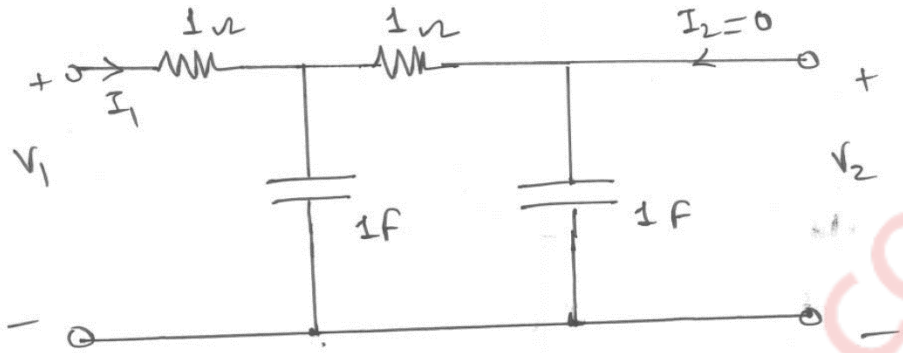
i. $P(s) = s^6 + 3s^5 + 8s^4 + 15s^3 + 17s^2 + 12s + 4$

ii. $P(s) = s^5 + s^3 + s$

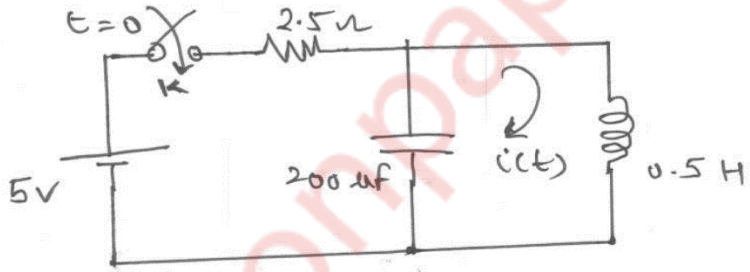
c) Write Mesh equations for the magnetically coupled circuit shown in fig. **5**



Q6 **a)** Determine $\frac{V_2}{I_1}, \frac{V_2}{V_1}$ for the network shown in the figure. **10**



b) For the circuit shown in the figure, the switch 'K' is closed at t =0 and steady state is attained before closing the switch. By using 'Laplace Transform' techniques determine i(t) for $t \geq 0$. **5**



c) Derive the condition of Reciprocity and symmetry for ABCD parameters. **5**
