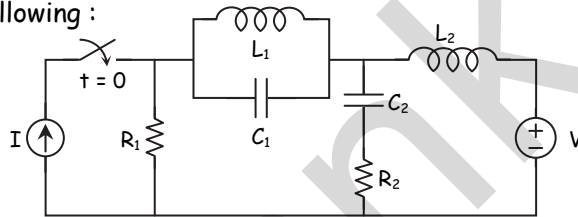


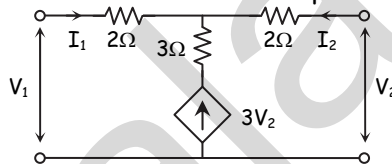
- N.B.:** (1) Question No. 1 is compulsory.
 (2) Solve any three questions out of remaining.
 (3) Assume suitable data if required.
 (4) All questions carry equal marks.

1. (a) Test whether $P(s) = s^5 + 12s^4 + 45s^3 + 60s^2 + 44s + 48$ is Hurwitz polynomial. [5]

- (b) Draw dual of the following : [5]

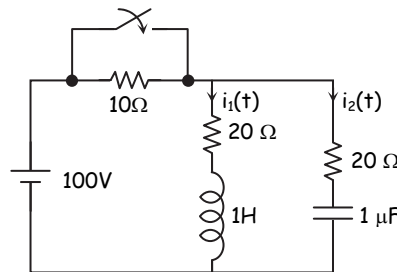


- (c) Determine the short circuit admittance parameters of the network shown : [5]

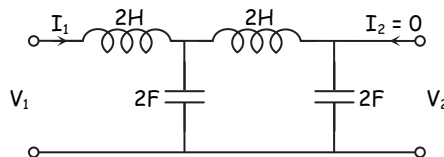


- (d) State and prove final value theorem of Laplace transform. [5]

2. (a) The network shown in figure, a steady state is reached with the switch open. At $t = 0$, the switch is closed. Determine $V_c(0^-)$, $i_1(0^+)$, $i_2(0^+)$, $\frac{di_1}{dt}(0^+)$ and $\frac{di_2}{dt}(0^+)$. [10]

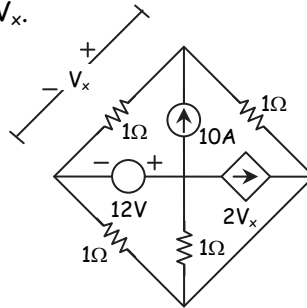


- (b) Find the network functions $\frac{V_1}{I_1}$, $\frac{V_2}{I_1}$, $\frac{V_2}{V_1}$ for the network shown : [5]

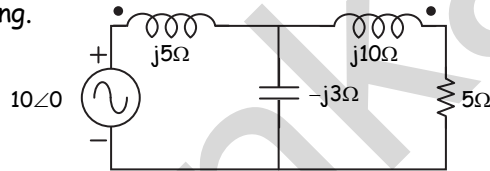


(c) In the circuit shown in figure, find V_x .

[5]



3. (a) Find the voltage across $5\ \Omega$ resistor in the network shown below. If $K = 0.8$ is coefficient of coupling. [8]

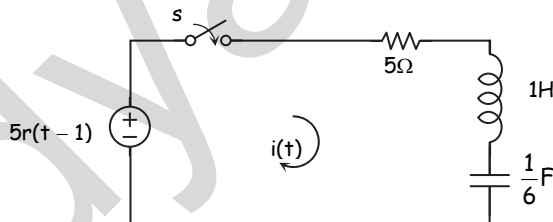


(b) Check the positive real function : [8]

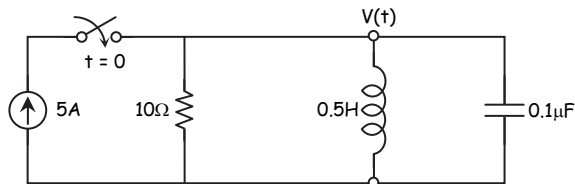
(i) $F(s) = \frac{s^2 + 6s + 5}{s^2 + 9s + 14}$ (ii) $F(s) = \frac{s^3 + 6s^2 + 7s + 3}{s^2 + 2s + 1}$

(c) List the types of damping in series R-L-C circuit and mention the condition for each damping. [4]

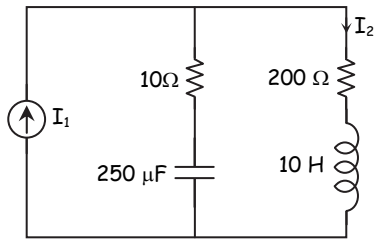
4. (a) For the network shown, determine the current $i(t)$ when the switch is closed at $t = 0$ with zero initial conditions. [8]



(b) In the given network switch is closed at $t = 0$. Solve for V , $\frac{dV}{dt}$, $\frac{d^2V}{dt^2}$ at $t = 0^+$. [8]



(c) Obtain pole-zero plot for $\frac{I_2}{I_1}$.



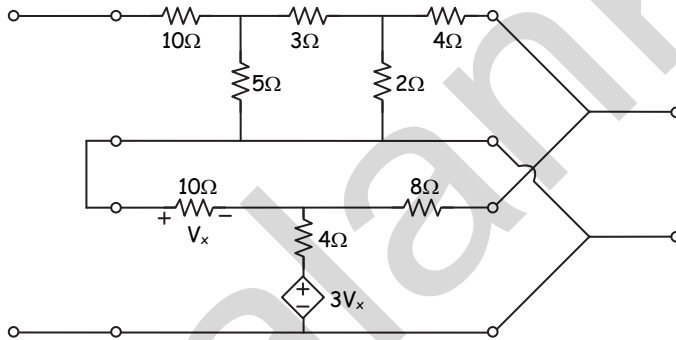
[4]

5. (a) Synthesize the driving point function using Foster - I and Foster - II form :

$$Z(s) = \frac{2(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$$

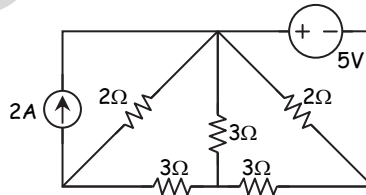
(b) Obtain hybrid parameter of the inter-connected network.

[10]



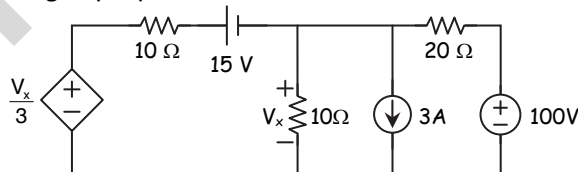
6. (a) For the network shown below, draw a graph of network. Select a tree and obtain :

- (i) Reduced incidence matrix
- (ii) f-cut set matrix
- (iii) f-tie set matrix



(b) Find V_x using superposition theorem.

[10]



□ □ □ □ □