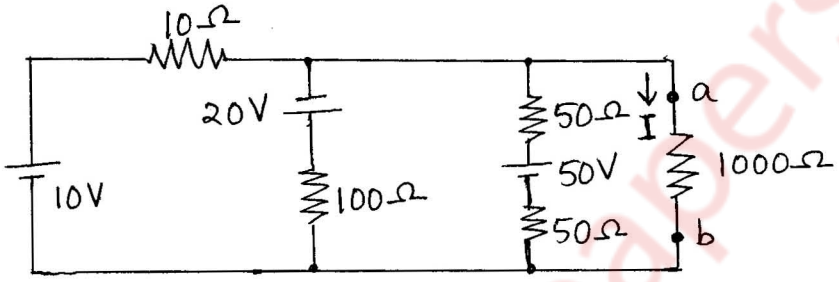
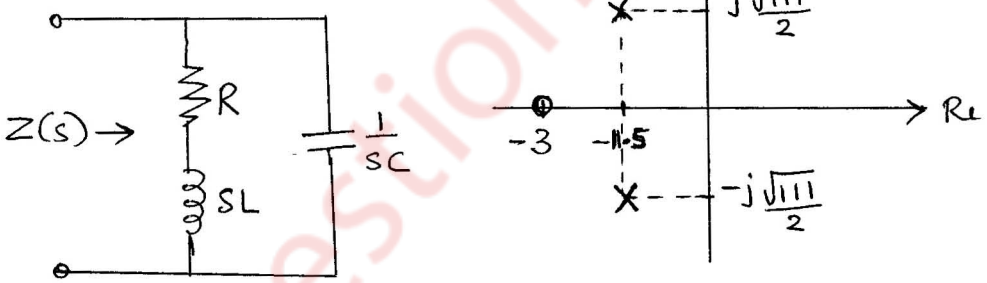
(3 Hours) Total Marks: 80

NB: (1) Question **No. 1** is compulsory.
(2) Attempt any **three** questions from the remaining.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if required.

1. (a) By constructing Millman's equivalent voltage source at the left of terminals *a* and *b* in the given circuit, find the current *I*. **(5)**

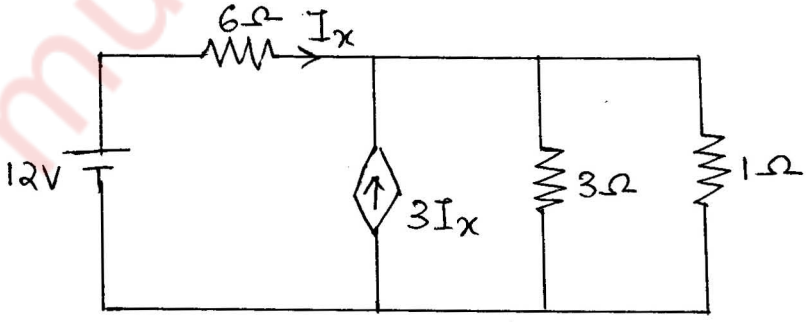


(b) A network and its pole zero diagram are shown in the figure. Determine the values of R, L, C if Z(0)=1. **(5)**



(c) Obtain *Z*- parameters in terms of *ABCD* parameters. **(5)**
(d) Explain various types of filters. **(5)**

2. (a) Find the current through the 1 Ω resistor in the given network **(8)**



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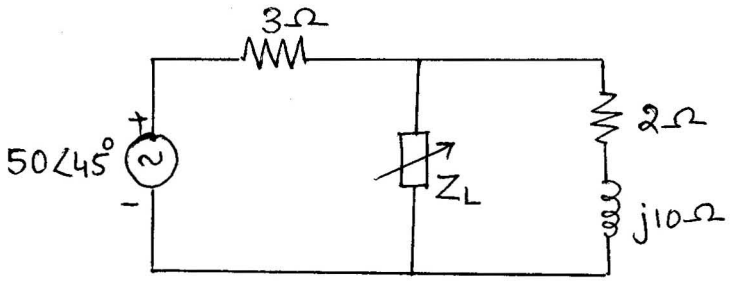
(b) Find the value of load impedance Z_L so that maximum power can be transferred to it in the network of figure. Find maximum power. **(6)**

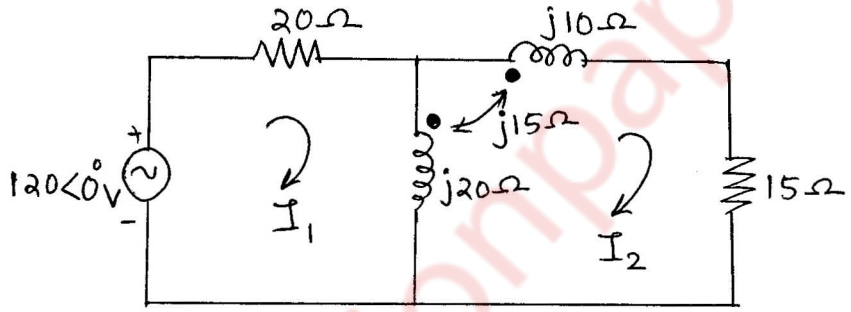


(c) Design a constant-k low-pass *T* and π section filters having cut-off frequency of 4kHz and nominal impedance of 500 Ω. **(6)**

3. (a) Check whether the following polynomials are Hurwitz polynomials: **(10)**

(i) $F(s) = s^4+s^3+4s^2+2s+3$
(ii) $F(s) = (s+2)^3$

(b) Find the voltage across the 15 Ω resistor in the given network using mesh analysis. **(10)**

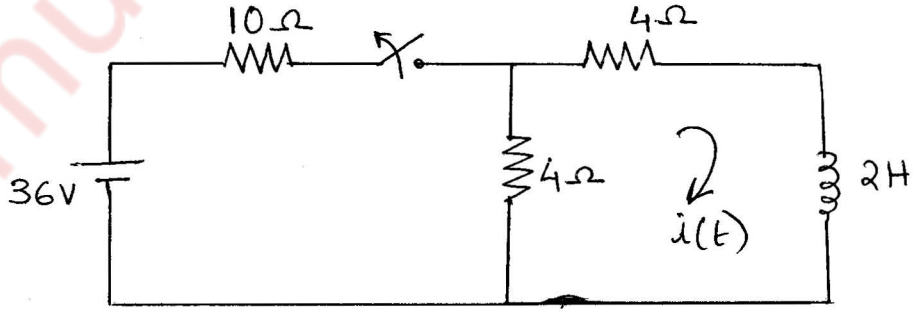


4. (a) Test whether the following functions are positive real functions: **(10)**

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

(ii) $F(s)=\dfrac{s(s+3)(s+5)}{(s+1)(s+4)}$

(b) The network shown in figure has attained steady state with the switch closed for $t < 0$. At $t=0$, the switch is opened. Obtain $i(t)$ for $t > 0$. **(10)**



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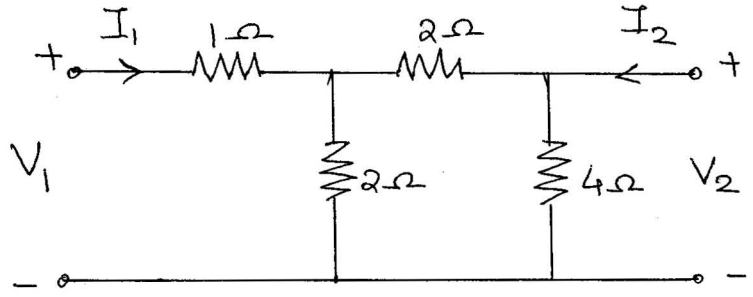
5. (a) Realize Cauer Form I and Cauer Form II of the following LC impedance function. **(8)**

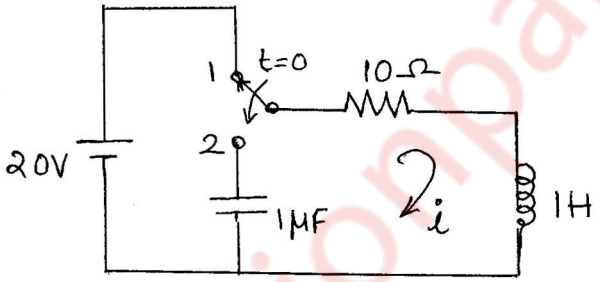
$$Z(s)=\frac{(s+1)(s+3)}{s(s+2)}$$

(b) Determine *Y*-parameters for the circuit given in figure. **(6)**



(c) 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 and hence obtain v(t). **(6)**

6. (a) In the circuit given, switch is changed from position *1* to position *2* at time *t=0*. Find *i*, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at time $t=0^+$. **(10)**



(b) Find the transmission parameters of the resulting circuit when both are in cascade connection. **(10)**