

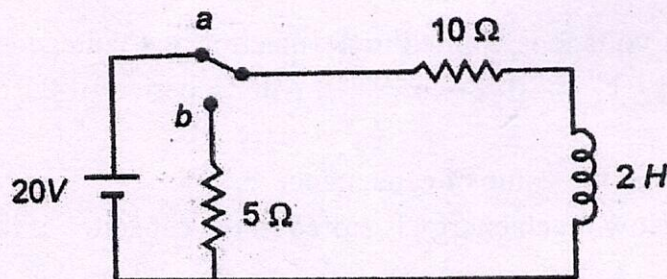
NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.

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- I. (a) State Kirchhoff's laws. (1)
(b) Describe the concept of complex frequency. (1)
(c) Describe the role of terminating half sections in a composite filter? (1)
(d) What is a symmetrical two-port network? (1)
(e) Define a stable network. (1)
(f) What is a notch filter? (1)
(g) What happens when a transmission line of finite length is not terminated in its characteristic impedance? (1)
(h) Differentiate between passive and active networks. (1)
(i) What are poles and zeros of a network function? What is their significance? (2)

Section A

- II. (a) The following circuit is operating under steady state condition when the switch is at position 'a'. At $t = 0$, the switch is moved to position 'b'. Draw the transform network after switching takes place and hence determine the current through the circuit. (5)



- (b) The transform current in a network is given by:

$$I(s) = \frac{4(s+2)s}{(s+1)(s+3)}$$

Draw the pole-zero plot and hence obtain current in time domain. (5)

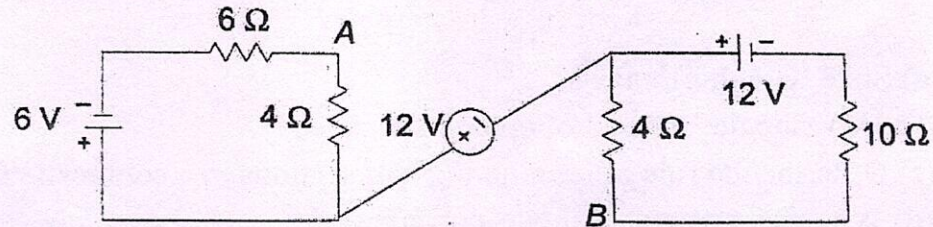
- III. (a) Describe the concept of ideal voltage and current source. (3)
(b) State the necessary conditions for a network function to be driving point function for a one port passive network. Explain giving all possible reasons whether the following function represents driving point impedance. (4)

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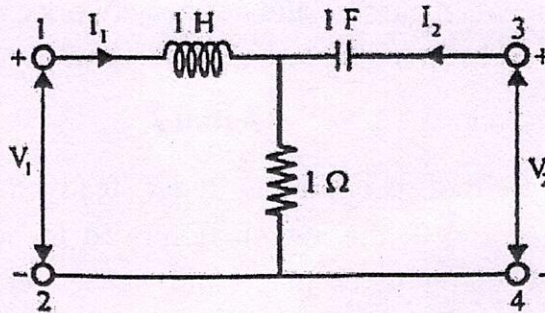
(2)

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

- (c) Determine the voltage across A and B in the following circuit. (3)



- IV. (a) Define Z and Y parameters of a two-port network. For the following network, compute the Z-parameters and hence draw the equivalent circuit in terms of Z-parameters. (5)



- (b) When dc voltage is applied to a capacitor, the voltage across its terminals is found to build as $v_C(t) = 50(1 - e^{-100t})$. After a period of 0.01 s, the current is equal to 2 mA.

- (i) Find the value of capacitance.
 (ii) How much energy is stored in the capacitor at this time? (5)

Section B

- V. (a) Explain secondary constants of a transmission line. Express these constants in terms of primary constants. (4)
 (b) Design m-derived low pass filter (T and π -type) with cut-off frequency of 6 kHz and design impedance of 500 Ω . The infinite-attenuation frequency should be 1.75 times the cut-off frequency. (6)
- VI. (a) Explain how an m-derived filter is obtained from a constant-k type. What are advantages and disadvantages of m-derived type over constant-k type? (5)
 (b) What are advantages of active filter? Explain the operation of an active All-pass filter. (5)
- VII. (a) Draw and explain the equivalent circuit of a two-conductor transmission line. (3)
 (b) Prove that a transmission line of finite length terminated by its characteristic impedance is equivalent to a line of infinite length. (3)
 (c) What is a filter? What are characteristics of an ideal filter? (4)