

N 1048

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Fourth Semester

Electrical and Electronics Engineering

EE 236 — NETWORK ANALYSIS AND SYNTHESIS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Express the impedance $Z(s)$ of the parallel combination of $L = 4$ H and $C = 1$ F. What frequencies of 's' is this impedance zero or infinite?
2. What is bode diagram?
3. What is a canonic network?
4. What is an oriented graph?
5. Draw three possible trees for graph shown below Fig. 5.

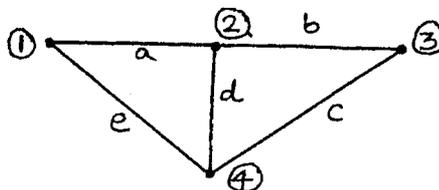


Fig. 5

6. Determine the elements of a T-Network shown in Fig. 6 in terms of Z and Y parameters.

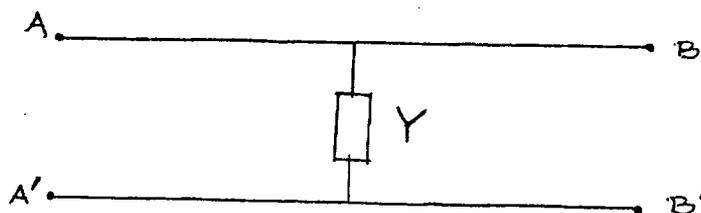


Fig. 6

7. What are the conditions for reciprocity and symmetry for h-parameters?
8. What are the practical and useful set of, necessary and sufficient conditions for $H(s)$ to be positive real function?
9. Test whether the following driving point function is minimum function or not $(s^5 + 4s^4 + 3s^3 + 2s^2 + s + 2) / (s^4 + 3s^3 + 4s^2 + 5s + 6)$.
10. What are the disadvantages of constant-K filter?

PART B — (5 × 16 = 80 marks)

11. (i) Determine the condition under which the input impedance of the network shown below Fig. 11 (i) will be equal to R . (6)

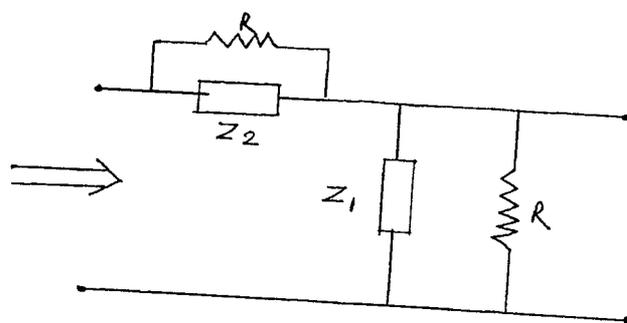


Fig. 11 (i)

- (ii) Using pole zero diagram find the current response in time domain of the function $I(s) = 4s / (s + 2)(s + 5)$. (10)
12. (a) (i) For the RLC network shown below Fig. 12 (a) (i) the values of R , L and C are 0.2 ohm, 1 H and 0.25 F.
 - (1) Write an expression for $G_{21}(s)$.
 - (2) Plot the transfer function G_{21} showing both asymptotic and true curves. (8)

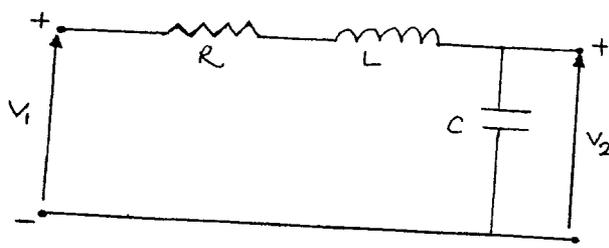


Fig. 12 (a) (i)

- (ii) A two branch parallel circuit has a resistance and inductor in one branch and a capacitor in the other. The transform impedance of the circuit is $Z(s) = 10^6(s + 10)/(s^2 + 10s + 5 \times 10^6)$. Find (1) parameters of the circuit (2) resonant frequency (3) bandwidth. (8)

Or

- (b) The network given below Fig. 12 (b) represents a resistive circuit. Determine the number of branches number of nodes and number of links. Write down the incidence matrix for the network. Also develop the network equilibrium equation. (16)

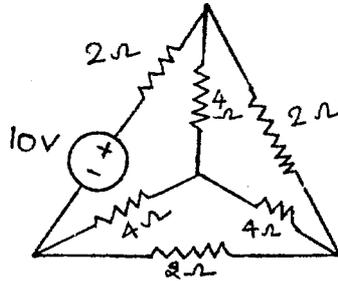


Fig. 12 (b)

13. (a) (i) Determine the Z and transmission parameters of the network shown below Fig. 13 (a) (i). Also show that the network is neither reciprocal nor symmetric. (10)

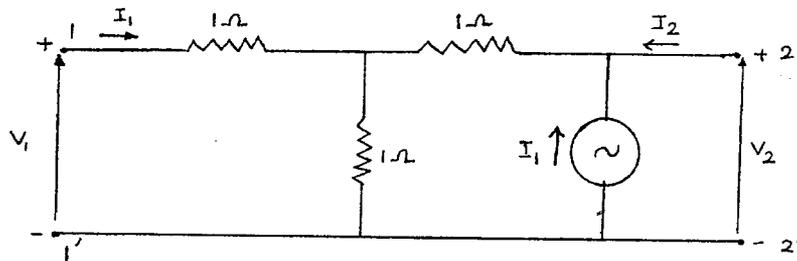


Fig. 13 (a) (i)

- (ii) A lossless transformer has primary and secondary inductance values as $L_1 = 1.5$ H and $L_2 = 3$ H respectively. What must be the maximum value of the coefficient of coupling for a physically realisable T-Network? (6)

Or

- (b) The currents I_1 and I_2 at input and output port respectively of two port network can be expressed as

$$I_1 = 5V_1 - V_2$$

$$I_2 = V_1 - V_2$$

- (i) Find the equivalent π -network.
 (ii) Find the input impedance when a load of $(3 + j5)$ ohm is connected across the output port. (16)

14. (a) (i) What is a Hurwitz Polynomial? List the properties of it. (8)
(ii) Find the limits of K , so that the polynomial $S^3 + 14S^2 + 56S + K$ may be Hurwitz. (8)

Or

- (b) For the driving point impedance $Z(s) = (s^2 + 1)/(s(s^2 + 2))$:
(i) Test if $Z(s)$ is a reactance function. (16)
(ii) If yes obtain both fosters realizations for this function. (8)
15. (a) (i) Draw the T and π sections of a constant low pass k -filter and derive the equations for cut off frequency. (8)
(ii) Design a m -derived high pass filter with a cut off frequency of 10 kHz, design impedance of 500 Ω and $m = 0.4$. (8)

Or

- (b) (i) Design a T -attenuator pad to give an attenuation of 20 db. The characteristics resistance is 500 Ω . (8)
(ii) A low pass π section filter consists of an inductance of 25 mH in the series arm and two capacitors of 0.2 μ F in the shunt arms. Calculate the cut off frequency, design impedance, attenuation at 5 kHz and phase shift at 2 kHz. (8)