D 257

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

Fourth Semester

Electrical and Electronics Engineering

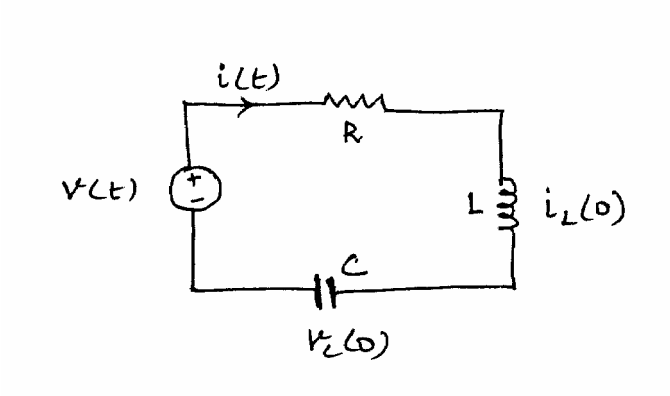
EE 236 — NETWORK ANALYSIS AND SYNTHESIS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Transform the series RLC network shown, to a network in the Laplace domain.

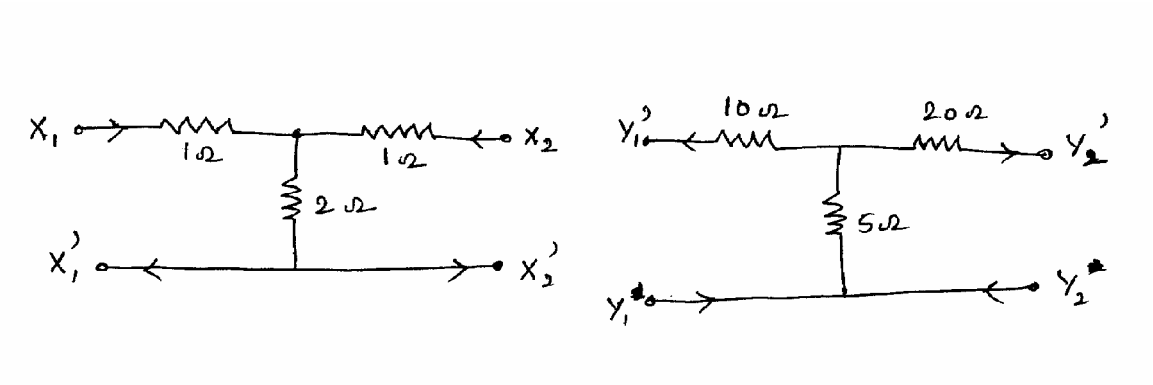


2. Define resonance frequency and quality factor for an RLC network.

3. What are the advantages of the graph theoretic method of network analysis?

4. What is a fundamental cut–set matrix?

5. Connect the two 2–port networks given below in series and simplify.



6. Express the elements of a T–network in terms of the ABCD parameters.

7. What are the properties of a positive real function?

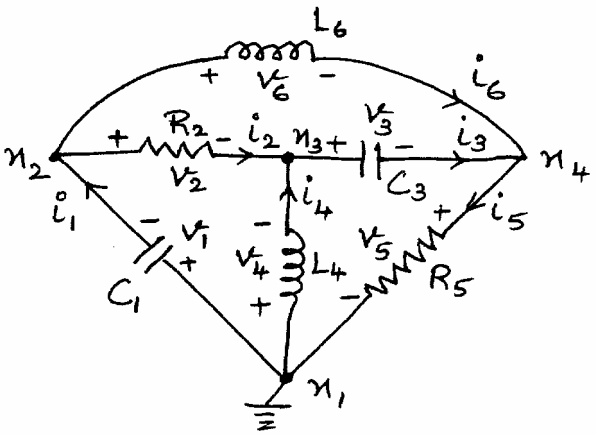
8. Test whether the polynomial $P(s) = s^4 + s^3 + 3s^2 + 2s + 12$ is Hurwitz.

9. Define Neper and Decibel units for attenuation and give their interrelationship.

10. Define propagation constant for a network.

PART B — (5 × 16 = 80 marks)

11. Obtain the matrix formulations using graph theoretic approach for the network shown below.



Consider $C_1 = C_3 = 1/2f$,

$R_2 = 1\Omega$, $R_5 = 2\Omega$, $L_4 = 1h$

$L_6 = 2h$, $v_{C_1}(0) = 1$ volt,

$v_{C_3}(0) = 0, i_{L_4}(0) = 1$ amp

and $i_{L_6}(0) = 0$.

12. (a) Draw the pole zero diagram for the given network function and hence obtain $v(t)$

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

Or

(b) Plot the asymptotic amplitude and phase response for the network shown in Fig. 12 (b). Let $v(t)$ be the input and $v_R(t)$ the response.

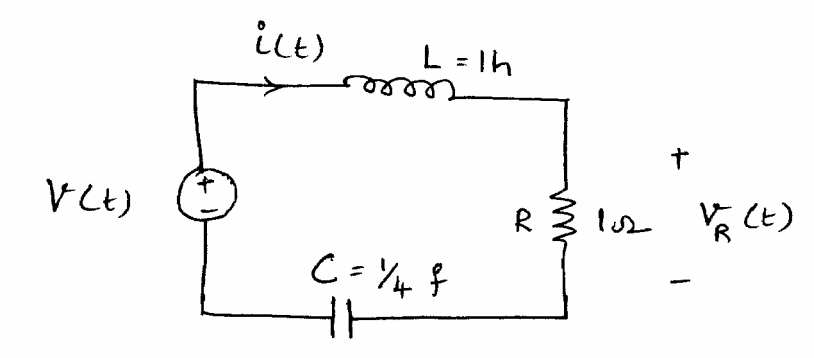


Fig. 12 (b)

13. (a) Find the Z–parameters for the two port network shown in Fig. 13 (a).

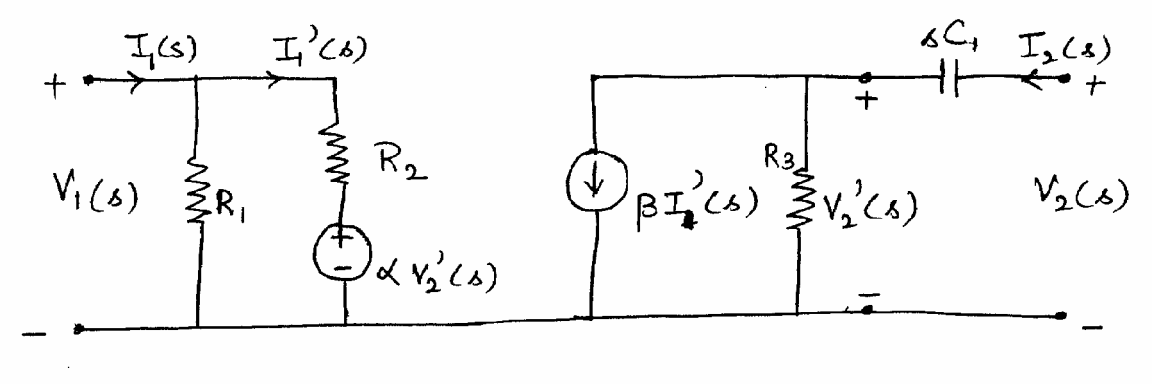


Fig. 13 (a)

Or

(b) The hybrid parameters of a two port network shown in Fig. 13 (b) are $h_{11} = 1\ K$; $h_{12} = 0.003$; $h_{21} = 100$; $h_{22} = 50\ \mu v$. Find V_2 and Z–parameters of the network.

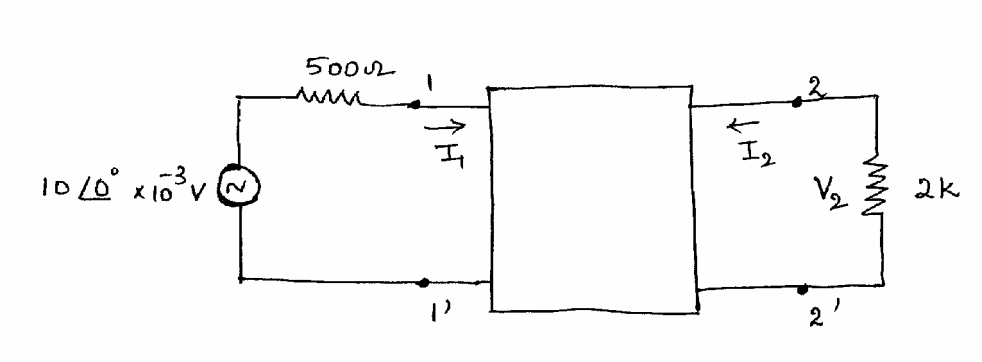


Fig. 13 (b)

14. (a) The driving point impedance of a one–port reactive network is given by,

$$Z(s) = \frac{5(s^2 + 4)(s^2 + 25)}{s(s^2 + 16)}$$

Obtain the first and second Foster networks.

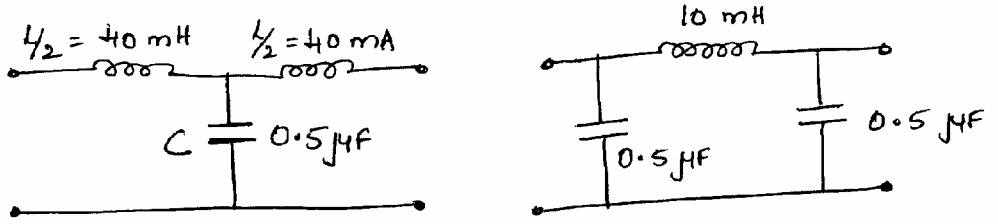
Or

(b) Find the R–L network corresponding to the driving point impedance function.

$$Z(s) = \frac{(s + 4)(s + 8)}{(s + 2)(s + 6)}$$

using Cauer form I and Cauer form II.

15. (a) Determine the cut off frequency for the T and π–section low pass filters shown below.



Also find the m–derived sections to have resonant frequencies of 1700 Hz and 3300 Hz for T and π networks respectively.

Or

(b) Design a T–type, π type, lattice type and a bridged T–type attenuators if the characteristic resistance is 200 Ω and the attenuation 20 dB.