2014

M.Sc.

1st Semester Examination

ELECTRONICS

PAPER—ELC-103

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

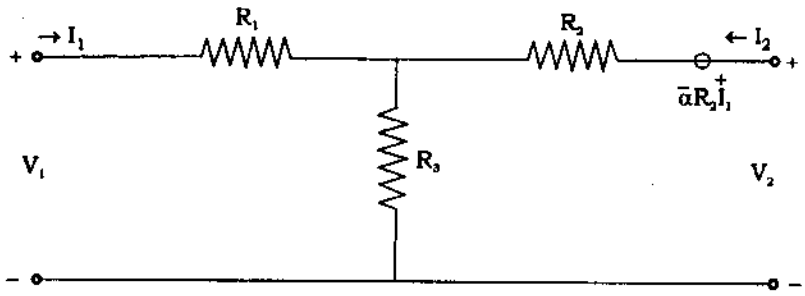
Illustrate the answers wherever necessary.

(Network Analysis and Synthesis)

Answer *Q. No. 1* and any *three* questions from the rest.

1. Answer *all* questions : 2×5

(a) Find the impedance matrix [Z] of the following circuit : 2×5

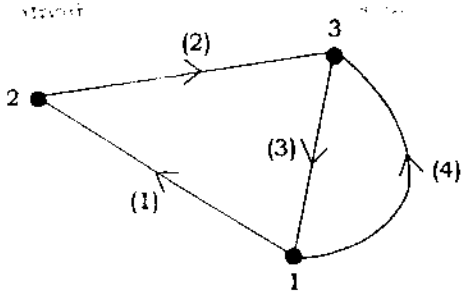


(b) What information you may get from the pole-zero plot ?

(c) If Z_{11} of a network is as follows, then draw the network :

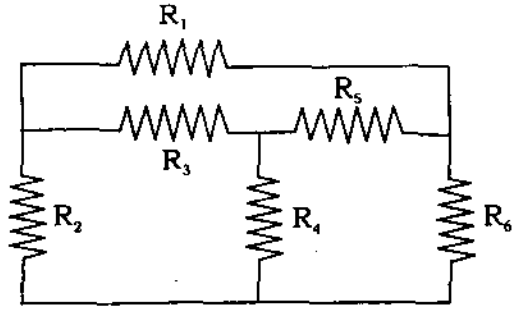
$$Z_{11} = S + \frac{1}{S + \frac{1}{S + \frac{1}{S}}}$$

(d) Determine the number of possible trees of the following network :



(e) Explain the even function symmetry, odd function symmetry and half wave symmetry in connection with Fourier series.

2. (a) Draw a network graph for the network shown below :

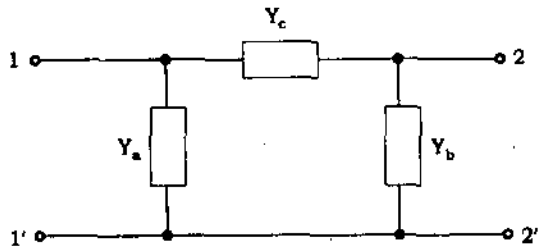


(b) The reduced incidence matrix of an oriented graph is :

$$A = \begin{bmatrix} 0 & -1 & 1 & 1 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

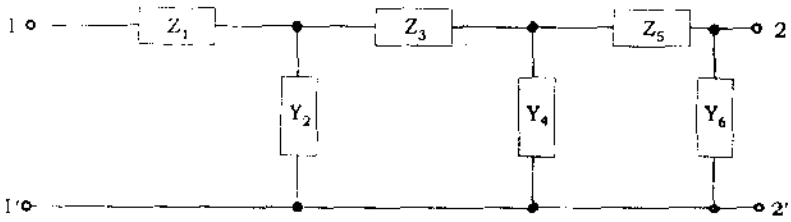
Draw the graph.

(c) Find out the admittance matrix of the following circuit :



3+4+3

3. (a) A general ladder network is shown below : State the driving point impedance at port 1 with port 2 open :

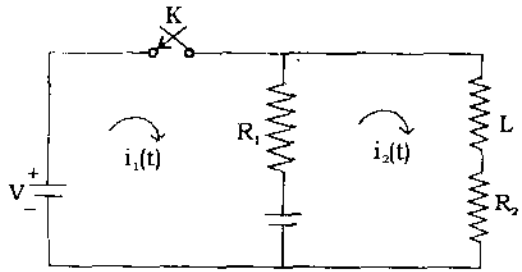


(b) Let us consider the following function :

$H(S) = 20\left(1+\frac{s}{100}\right)$; Symbols have their usual meanings.

Sketch its Bode plot.

(c) A network is shown below. Find the expression for $i_1(s)$ and $I_2(s)$ when the switch is closed :



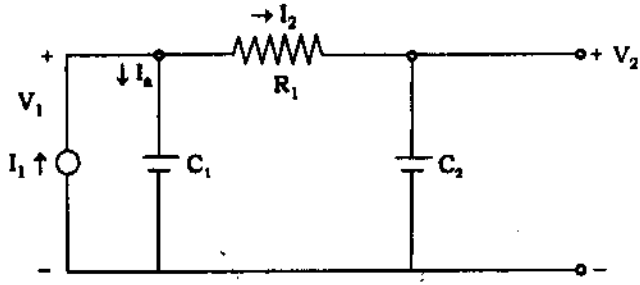
(d) A function in Laplace domain is given by :

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

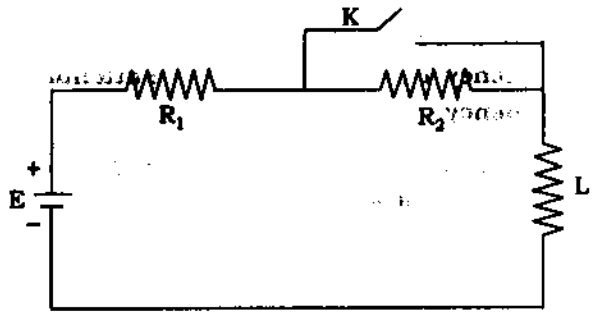
Obtain its value by final value theorem in t domain.

2+4+2+2

4. (a) Find out the current gain $\alpha_{12}(s)$ and transfer impedance $Z_{12}(s) = \frac{V_2(s)}{I_1(s)}$, $\alpha_{12}(s) = \frac{I_2(s)}{I_1(s)}$ of the following circuit :



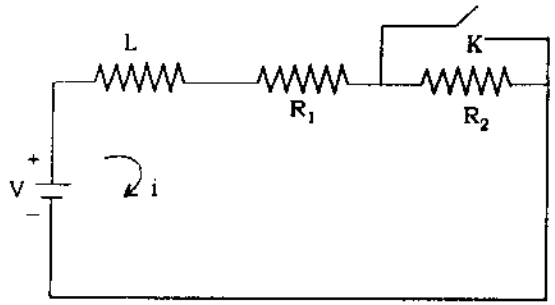
(b) In the given figure, the battery voltage is applied for a steady state period. Obtain the compute expression for the current after closing the switch K. Assume $R_1 = 1\Omega$, $R_2 = 2\Omega$, L = 1H, and E = 10V.



5+5

5. (a) Show that the nominal characteristics impedance of a constant K filter is $\sqrt{\frac{L}{C}}$.

(b) For the network shown below the switch K is closed at t = 0. Determine the current *i* in the circuit :



5+5

6. (a) Design a constant – K low-pass T section filter with a nominal resistance of 50Ω to produce cut off at a frequency 1.2 KHz. Find out the attenuation at 2 KHz frequency.

(b) Determine the expression for the driving point impedance of a relative network which was poles at w = 0, 4000 rad/s and α, zeros are to be located at w = 2000 and 6000 rad/s. The impedence is to be – j 700 ohm at 1000 rad/s. 5+5

[Internal Assessment — 10 Marks]