PG/IS/ELC/103/23

M.Sc. 1st Semester Examination, 2023

ELECTRONICS

(*Network Analysis and Synthesis*)

PAPER – ELC-103

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

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

GROUP – A

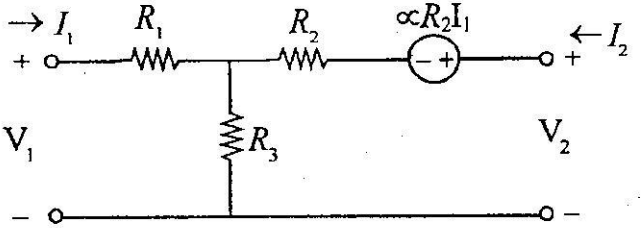
Answer any **four** questions : 2×4

1. Define the terms : Tree, link, twig and branch. $\frac{1}{2} \times 4$

2. State and explain the maximum power transfer theorem. $1 + 1$

3. Find out the Laplace transform of rectangular pulse of width 'a'. 2

4. Find out the z-matrix of the following two-port network 2



5. What do you mean by positive real functions ? Write down some of its properties. 1 + 1

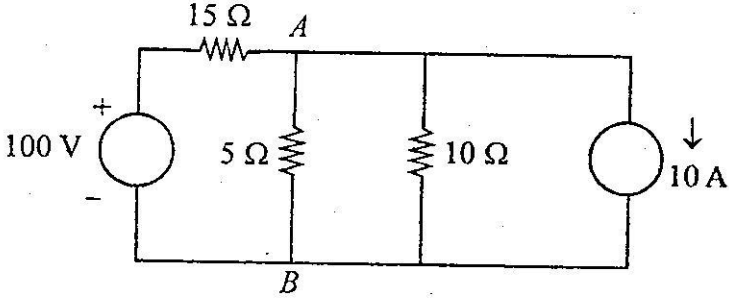
6. Comment if the following impedance function is realizable or not

$$z(s) = \frac{15(s^3 + 2s^2 + 3s + 2)}{s^4 + 6s^3 + 8s^2}$$ 2

GROUP – B

Answer any **four** questions : 4×4

7. Using Thevenin's theorem determine the current in the branch AB of the circuit presented below : 4

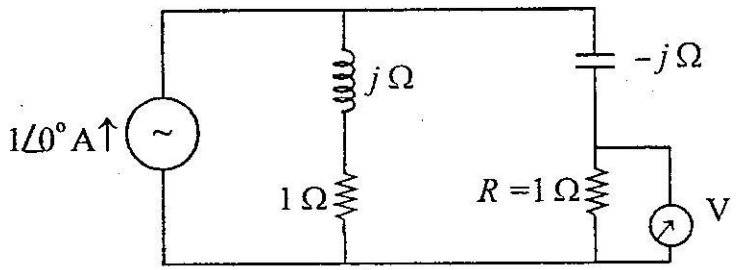


8. The reduced incidence matrix of an oriented graph is

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

Draw the graph. 2 + 2

9. In the following circuit find the reading of the voltmeter V. Inter change the current source and the voltmeter and verify the reciprocity theorem. 4



10. Prove that for a reciprocal network AD-BC = 1, where A, B, C, D represents the transmission parameters of a two-port network. 4

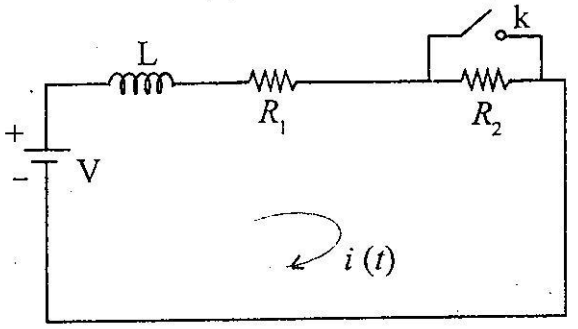
11. Find the first foster network of the driving point impedance function of a reactive network which has poles at $\omega = 0$, 4000 rad/sec, and Infinity, zeros are to be located at $\omega = 2000$ and 6000 rad/sec. The impedance to be –j 700Ω at 1000 rad/sec. 4

12. Design a constant k low pass T-section filter with a nominal resistance of 50Ω to produce cut off at a frequency of 1.2 kHz. Find also the attenuation in dB at a frequency of 2 kHz. 3 + 1

GROUP – C

Answer any **two** questions : 8 × 2

13. For a two port network prove that $\Delta z.\Delta y = 1$ consider in the following network we first close the switch(k) at t = 0, Find i(t). 5 + 3



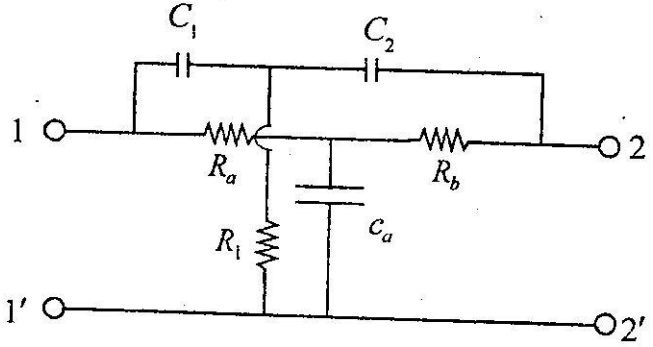
14. What are continued fraction networks ? The *driving point impedance function of a reactive* network is

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

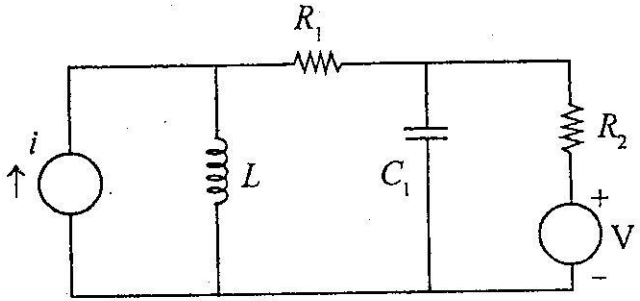
Develop the two continued fraction networks. 2+(3+3)

15. Prove that the y parameters of two port networks connected in parallel are equal to the sum of each individual networks.

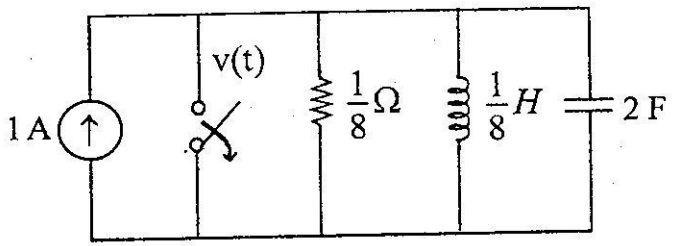
Determine y_{11} for the following network 4×4



16. How many trees are possible for the graph of the following network ? 4×4



Determine v(t) for the following network



[Internal Assessment – 10 Marks]