

Total number of printed pages-5

1 (Sem-3) ECT

2024

**ELECTRONICS AND COMMUNICATION
TECHNOLOGY**

Paper : ECT0300104

(Network Analysis)

Full Marks : 45

Time : 2 hours

***The figures in the margin indicate
full marks for the questions.***

1. Fill in the blanks : 1×5=5
- (a) A series network of resistors used for providing different voltages from a single voltage source is called _____ .
- (b) A filter allows a particular frequency range to pass which is known as _____ band.
- (c) The total resistance of a parallel circuit is always _____ than the lowest resistance connected in any of its branches.

Contd.

- (d) A balanced form of π -section is also known as _____ section.
- (e) If $f(t) = 1$, then $F(s) =$ _____.
2. Answer **any five** from the following questions : 2×5=10
- (a) State Superposition Theorem.
- (b) Define Ideal constant voltage source and Ideal constant current source.
- (c) Draw a low-pass prototype filter (both T-section and π -section).
- (d) Write the mathematical expression for Laplace Transform and Inverse Laplace Transform.
- (e) In an RC-type low-pass filter, $R = 550\Omega$ and $f_c = 400\text{Hz}$. Determine the value of C.
- (f) What do you mean by Tree and Twigs in Network Theory?
- (g) Define node and branch of a network.
- (h) Determine the Laplace transform of an exponential function.

- (i) Draw the block diagram of a two-port network.
- (j) What are transfer Impedance and Admittance?

3. Answer **any four** of the following questions : 5×4=20

- (a) State and explain voltage division rule.
- (b) Transform the circuit from delta to Y:

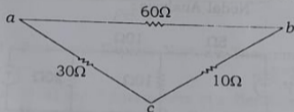


Fig. 1

- (c) What are poles and zeros in a network function? Determine the poles and zeros of the transfer function given by

$$Z(s) = \frac{2(s+2)(s+4)}{(s+3)(s+5)(s+7)}$$

- (d) Derive the Step response of RL circuit using Laplace transform.

(e) Explain briefly the different types of graphs in network theory.

(f) Find the Laplace transform of a

$$\text{derivative } \left[\frac{df(t)}{dt} \right].$$

(g) Determine the current through 20Ω resistor in the following circuit using Nodal Analysis:

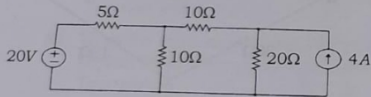


Fig. 2

(h) State and explain Reciprocity Theorem.

4. Answer **any one** of the following questions:

10

(a) What is Filter? Describe different types of Passive types of passive filters with proper diagrams. 2+8=10

(b) State Thevenin's theorem. Apply Thevenin's theorem to find the current through load resistor R_L of the circuit given below. Here $V_S = 20V$, $R_1 = 10\Omega$, $R_2 = 10\Omega$, $R_3 = 5\Omega$ and $R_L = 100\Omega$. 2+8=10

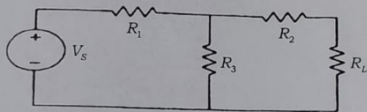


Fig. 3

(c) State and Explain Norton's Theorem. 2+8=10

(d) What are Z parameters of a Network? How will you find the Z parameters of the following two-port Network.

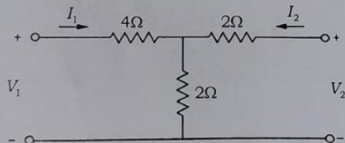


Fig. 4