University Institute of Engineering & Technology

(Recognised Under Section 2(f) and 12B of UGC)

Kurukshetra University, Kurukshetra

Roll No. - [redacted]

THEORY EXAMINATION – DEC 2022		TIME – 3 Hrs.
B.TECH - ECE	SEMESTER - III	M.M. - 75

PAPER - EC-213

SUBJECT- NETWORK THEORY

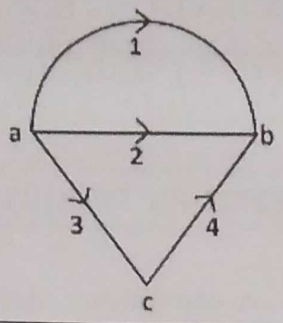
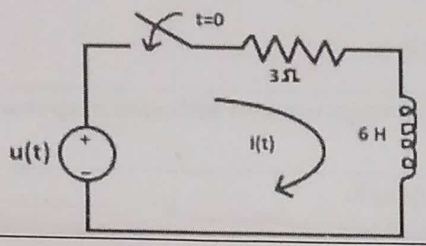
Note: All questions in Part-A and Part-B are compulsory. Attempt any four questions from Part-C selecting at least one from each unit.

PART-A (15 Marks)

Q. No. – 1 Answer the following questions. **15x1=15**

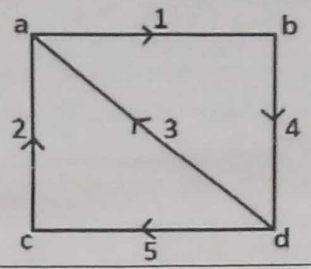
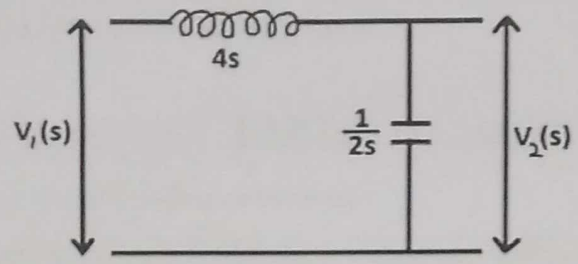
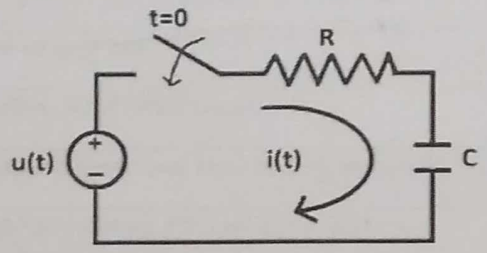
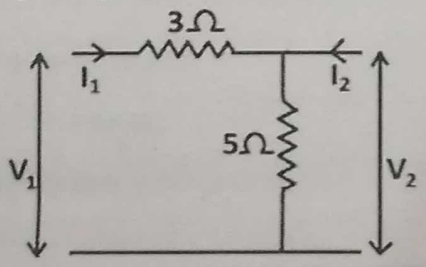
(i)	**Differentiate between unit impulse response and unit step response of a network?**
(ii)	**Define Branches and Nodes of a graph.**
(iii)	**Define Tree of a graph.**
(iv)	**Define Positive Real (PR) functions.**
(v)	**Define Transfer Function H(s) of any network.**
(vi)	**Differentiate between LPF and HPF Filters.**
(vii)	**Differentiate between Stable and unstable Network.**
(viii)	**Calculate Y_{12}, Y_{22} of a Symmetric and Reciprocal network if $Y_{11} = 1$, $Y_{21}=2$.**
(ix)	**Define unit ramp function r(t).**
(x)	**Define Hurwitz Polynomial.**
(xi)	**Define unit step function u(t).**
(xii)	**Define Transient Response of a network.**
(xiii)	**Define unit impulse function δ(t).**
(xiv)	**Differentiate between cut-off frequency f_c and frequency of resonance f_x of a filter.**
(xv)	**Define Steady State Response of a network.**

PART-B (20 Marks)

	UNIT-I	
2	**Find the incidence matrix [A_i] of the following graph:**  	5
	UNIT-II	
3	**Derive the expression of unit step response i(t) of the series RL circuit given below. The circuit is initially open for t < 0 and closed at t = 0.**  	5
	UNIT-III	
4	**Find all Z-parameters of a 2-port network having following input and output equations: Find if it is reciprocal or symmetric?** $V_1 = 3I_1 + 4I_2$ $V_2 = 4I_1 + 8I_2$	5
	UNIT-IV	
5	**A network has the following Transfer Function H(s), Plot Poles and Zeroes of H(s) and Find if the network is Stable or not.** $H(s) = \frac{(s-5)}{(s+1)(s+2)(s+4)}$	5

PART-C (40 Marks)

	UNIT-I	
6	**The complete incidence matrix [Ai] of a graph is given below:** **(a) Draw the corresponding graph** **(b) Calculate the total no. of trees of this graph.** $[A_i] = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} a & b & c \end{array} \\ \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix} \end{array}$	10

7	From the following graph of a circuit : (a) Find the complete incidence matrix $[A_i]$ (b) Calculate the total no. of trees of this graph.  	10
	UNIT-II	
8	Find the Voltage Transfer Function $H(s)= V_2(s)/V_1(s)$ of the following circuit:  	10
9	Using Laplace Transform prove that the unit step response i(t) for the following series RC circuit for $t > 0$ is given by $i(t) =(1/R)e^{-(1/RC)t}$.  	10
	UNIT-III	
10	For the following two-port network:  (a) Calculate its Z-parameters (b) Find if it is Reciprocal or Symmetric (c) Draw Z-parameter equivalent model Circuit.	10
11	For a 2-port network having following Z-parameters: $Z_{11}=4$, $Z_{12}=2$, $Z_{21}=3$, $Z_{22}=2$ (a) Convert Z-parameters into Y-parameters. (b) Find if it is Reciprocal or Symmetric. (c) Draw its Y-parameter equivalent model Circuit.	10
	UNIT-IV	
12	(a) Write all the necessary and sufficient conditions of a Hurwitz Polynomial ?	10

	(b) Find if the following Polynomial is Hurwitz or not $P(s)= s^5+ 3s^4 + 3s^3 + 4s^2 + s +1$	
13	(a) Write all the necessary and sufficient conditions of a Positive Real (PR) function? (b) Find if the following function is Positive Real (PR) function or not: $F(s) = \frac{s^2+2s+20}{s+10}$	10