FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE/INFORMATION SCIENCE ENGINEERING/DATA SCIENCE ENGINEERING

PRACTICE PAPER III

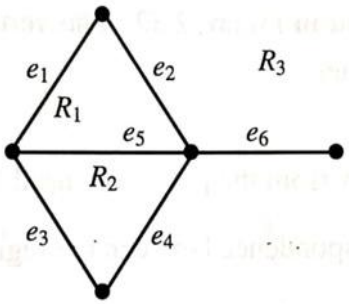
Semester: III	**Session:** Aug- Dec 2022
Course Name: Discrete Mathematics and Graph Theory	**Course Code:** 21CIDS31
Date:	**Max Marks:** 50
Time:	**Duration:** 90 min

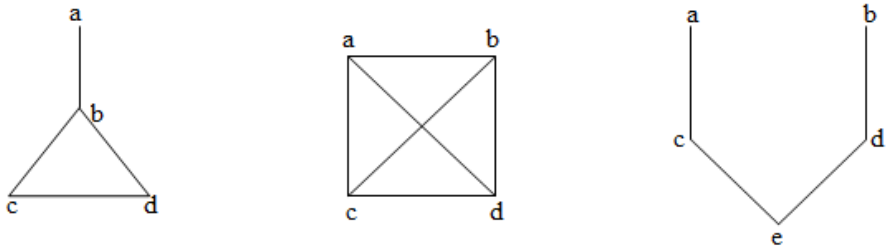
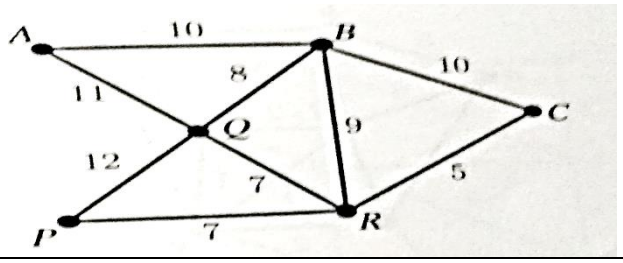
Note:

i. **PART - A (Question 1-5) answer any 4 full questions.**

ii. **PART - B (Question 6-8) answer any 2 full questions.**

iii. **PART - C (Question 9) is compulsory to attend.**

Q. No		Questions	Marks	CO's	Bloom's Level
		PART -A (4×5 = 20 Marks)			
1.		Prove that for any three propositions p, q and r: $[(p \vee q) \rightarrow r] \Leftrightarrow [(p \rightarrow r) \wedge (q \rightarrow r)]$	5	CO1	L2
2.		Find the Rook polynomial for the 3x3 board by using the expansion formula.	5	CO2	L2
3.		Using generating function, find the number of partitions of n = 6 into distinct summands.	5	CO3	L3
4.		Construct the duals for the following planar graphs.  	5	CO5	L2
5.		Suppose that a tree T has two vertices of degree 2, four vertices of degree 3 and three vertices of degree 4. Find the number of pendent vertices in T.	5	CO5	L2
		PART -B (2×9 = 18 Marks)			
6.	**a**	Let A={2,8,14,18} Let R be a relation on A defined by xRy if and only if $x - y > 5$ i. Write down R as a set of ordered pairs. ii. Write M(R). iii. Draw a directed graph of the relation. iv. Determine the indegree and out-degree of the vertices in the digraph.	4	CO2	L3
	b	Determine the truth value of each of the following quantified statements, the universe being the set of all non-zero integers. (i) $\exists x, \exists y, [xy = 1]$ (ii) $\exists x, \forall y, [xy = 1]$ (iii) $\forall x, \exists y, [xy = 1]$ (iv) $\exists x, \exists y, [(2x + y = 5) \wedge (x - 3y = -8)]$ (v) $\exists x, \exists y, [(3x - y = 17) \wedge (2x + 4y = 3)]$	5	CO1	L3

7.	**a**	Define the terms with example for each: i. Planar Graph ii. Non planar graph	4	CO4	L1
	b	Find the chromatic polynomial for the graph. 	5	CO4	L2
8.	**a**	Explain the following terms with an example i. Sorting and Prefix Codes. ii. Minimal Spanning Trees.	4	CO5	L1
	b	Construct the optimal prefix code for the symbols A, B, C, D, E, F, G, H, I, J that occurs with frequencies 78, 16, 30, 35, 125, 31, 20, 50, 80, 3 respectively.	5	CO3	L3
PART -C (1×12 = 12 Marks)					
9.	**a.**	Solve the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ with the initial conditions $a_0 = 1$ and $a_1 = 4$	6	CO3	L3
	b.	Using the Kruskal's algorithm find a minimal spanning tree of the given weighted graph 	6	CO4	L3

Course Outcomes:	
CO-1	Discuss logical reasoning to verify the correctness of the logical statements and Perform set operations.
CO-2	Illustrate the relations, partially ordered sets and lattices in data bases and data structures.
CO-3	Employ generating function techniques to solve recurrence relations problems
CO-4	Examine recurrence relations to solve problems involving an unknown sequence in engineering problems
CO-5	Solve network analysis problems using graph theory.
CO-6	Employ graphs for Mathematical structures, trees, and shortest path techniques in computer applications.

Programme Outcomes:

PO-1: Knowledge, **PO-2:** Analyze, **PO-3:** Design, **PO-4:** Conduct, **PO-5:** Tools, **PO-6:** Societal Problems, **PO-7:** Sustainability, **PO-8:** Ethics, **PO-9:** Teamwork and leadership qualities, **PO-10:** Communication, **PO-11:** Project and finance management, **PO-12:** Lifetime Learning

CO/PO: Mapping

(3/2/1 indicates strength of correlation) 3-High, 2-Medium, 1-Low

Course Outcome (COs)	**Programme Outcome (POs)**											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	2	1									
CO-2	3	2	1									
CO-3	3	2	1	1	2							
CO-4	3	2	1	1	2							
CO-5	3	2	1						1			

CO-6	3	2	1	1					1			

L1	L2	L3	L4	L5	L6
Remembering	Understanding	Applying	Analyzing	Evaluating	Creating