FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE/INFORMATION SCIENCE/DATA SCIENCE ENGINEERING

MODEL QUESTION PAPER

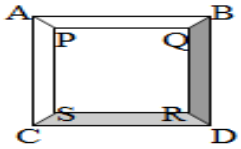
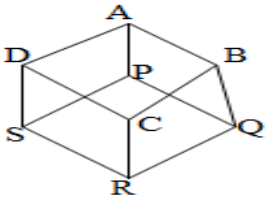
Semester: III	**Session:** Aug- Dec 2022
Course Name: Discrete Mathematics and Graph Theory	**Course Code:** 21CIDS31
Date:	**Max Marks:** 50
Time:	**Duration:** 3 hr.

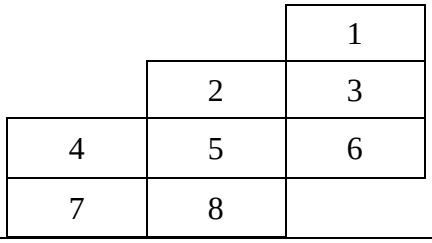
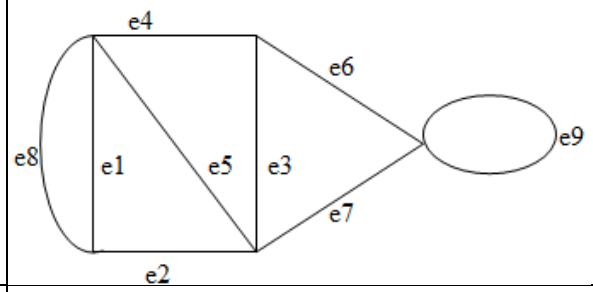
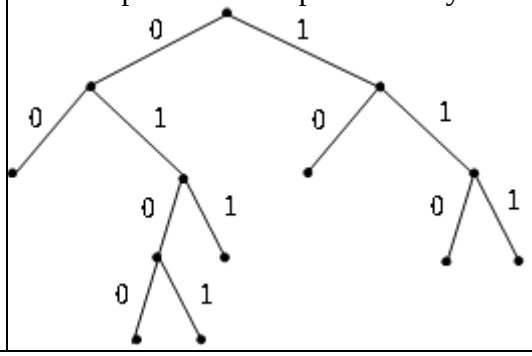
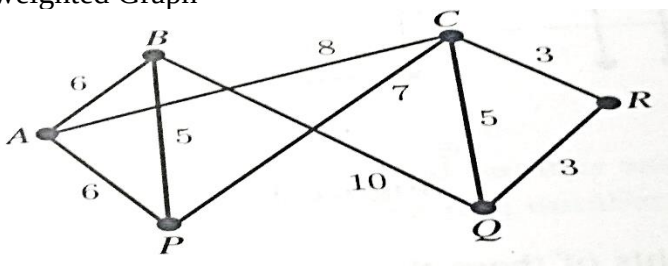
Note:

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 proposition p, q, r the compound proposition $\{p \rightarrow (q \rightarrow r)\} \rightarrow \{(p \rightarrow q) \rightarrow (p \rightarrow r)\}$ is a tautology.	5	CO1	L3
2.		Prove that (A, R) is a POSET, where $A = \{1,2,3,4,6,12\}$ and R is defined by $aRb \Leftrightarrow a \text{ divides } b$. Also write a diagraph.	5	CO2	L3
3.		An apple, a banana, a mango and an orange are to be distributed to four boys B1, B2, B3, B4 The boys B1 and B2 do not wish to have apple, the boy B3 does not want banana or mango, and B4 refuses orange. In how many ways the distribution can be made so that no boy is displeased?	5	CO2	L3
4.		Define Isomorphism with example. Verify that the given graphs are   isomorphic.	5	CO5	L3
5.		Use merge-sort method and sort the list 7, 3, 8, 4, 5, 10, 6, 2, 9.	5	CO2	L3
		PART -B (2×9 = 18 Marks)			
6.	**a**	Prove the validity of the following argument. $p \rightarrow q$ $q \rightarrow (r \wedge s)$ $\neg r \vee (\neg t \vee u)$ $p \wedge t$ $\therefore u$	4	CO1	L3
	b	Express the following statements in symbolic form using quantifiers and write truth values I. Every real number has an additive inverse II. The set of real numbers has a multiplicative identity.	5	CO1	L2

		III. The integer 58 is equal to the sum of two perfect squares.			
7.	**a**	By using the expansion formula, find the Rook polynomial for the board 'C' shown below. 	4	CO2	L3
	b	Find the exponential generating function for the number of ways to arrange '$n \geq 11$' letters, selected from each of the following words. **i)** MISSISSIPPI **ii)** ISOMORPHISM **iii)** ENGINEERING	5	CO3	L3
8.	**a**	Check the planarity of the following graph by the methos of elementary reduction. 	4	CO5	L3
	b	Find the prefix code represented by the following tree 	5	CO6	L3
		PART -C (1×12 = 12 Marks)			
9.	**a.**	Solve the recurrence relation $F_{n+2}=F_{n+1}+F_n$ for $n\geq 0$, given $F_0=0$ and $F_1=1$.	6	CO4	L3
	b.	Use the Kruskal's algorithm find a minimal spanning tree of the given weighted Graph 	6	CO6	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