JGI JAIN DEEMED-TO-BE UNIVERSITY | FACULTY OF ENGINEERING AND TECHNOLOGY

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

PRACTICE PAPER II

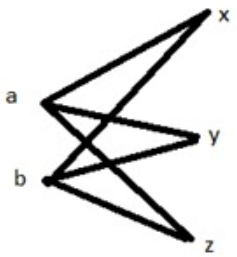
Semester: III	**Session:** Aug- Dec 2022
Course Name: Discrete Mathematics and Graph Theory	**Course Code:** 21CIDS31
Date:	**Max Marks:** 50
Time:	**Duration:** 90 min

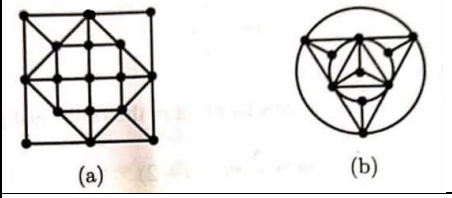
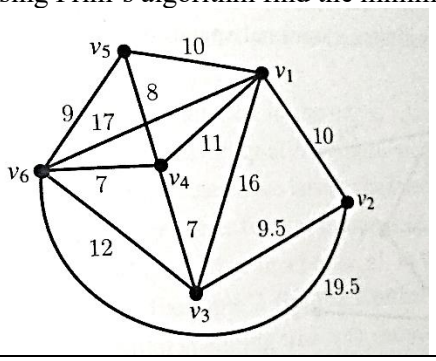
Note:

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 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	L2
2.		Find the rook polynomial for the board shown below (shaded part) using product formulae. 1 2 3 4 5 6 7 8 9 10 11	5	CO2	L3
3.		In how many ways can 12 oranges be distributed among three children A, B, C, so that A gets at least four, B and C get at least two, but C gets no more than five?	5	CO3	L3
4.		Consider the graph K2,3 shown in the below Figure. Let A denote the number of colors available to properly color the vertices of this graph. Find: i. how many proper colorings of the graph have vertices a, b colored the same? ii. how many proper colorings of the graph have vertices a, b colored differently? iii. the chromatic polynomial of the graph. 	5	CO4	L3
5.		If a tree T has four vertices of degree 2, one vertex of degree 3, two vertices of degree 4, one vertex of degree 5. Find the number of leaves in tree.	5	CO5	L2
		PART -B (2×9 = 18 Marks)			
6.	**a**	State the Pigeonhole principle. Also, prove that if 5 colours are used to paint 26 doors, then atleast 6 doors will have the same colour.	4	CO2	L2

	b	Write down the following statements in symbolic form using quantifiers: i. Every real number has an additive inverse ii. The set of real numbers has a multiplicative identity. iii. The integer 58 is equal to the sum of two perfect squares.	5	CO1	L3
7.	**a**	Define the terms with example for each: i. Hamiltonian path. ii. Hamiltonian circuit.	4	CO4	L1
	b	For the diagram of a graph shown below verify Euler's formula  	5	CO4	L2
8.	**a**	Explain the following terms with an example i. Spanning Trees. ii. Rooted Tree.	4	CO5	L1
	b	Construct the optimal prefix code for the message "ROAD IS GOOD". Indicate the code.	5	CO5	L3
		PART -C (1×12 = 12 Marks)			
9.	**a.**	Solve the recurrence relation $a_n = 2(a_{n-1} - a_{n-2})$ for $n \geq 2$, given that $a_0 = 1$ and $a_1 = 2$.	6	CO3	L3
	b.	Using Prim's algorithm find the minimal spanning tree for the 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