U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

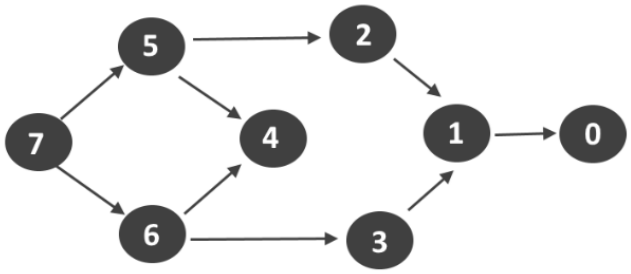
Programme: B.E. **Semester: IV**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 23CS4PCADA **Max Marks: 100**
Course: Analysis and Design of Algorithms

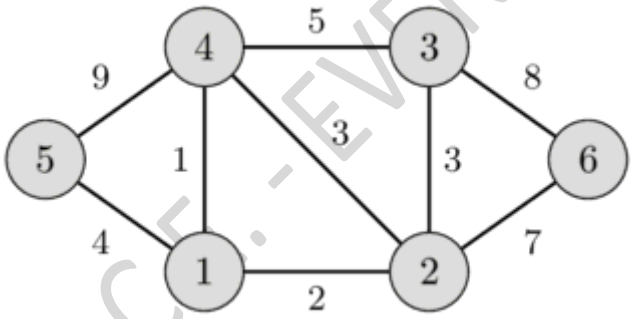
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

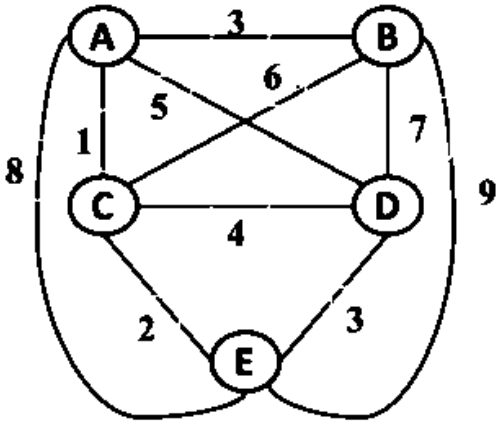
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Derive the best case, average case and worst-case time complexities of Binary search algorithm.	CO 1	PO 2	5
	b)	Differentiate among different types of asymptotic notations with suitable example.	CO 1	PO 2	10

	c)	Find time complexity for the below algorithm:
		ALGORITHM
		UniqueElements(A[0..n − 1])
		//Determines whether all the elements in a given array are distinct
		//Input: An array A[0..n − 1]
		//Output: Returns “true” if all the elements in A are distinct
		// and “false” otherwise
		for i ←0 to n − 2 do
		for j ←i + 1 to n − 1 do
		if A[i]= A[j] return false
		return true
			CO 1	PO 2	5

		UNIT - II			
2	a)	“Johnson Trotter method is efficient method for generating permutation”? Justify the statement. Generate all permutation for the following set using Johnson Trotter algorithm: **{1,3,5,7}**	CO 2	PO 1	6
	b)	Find topological ordering of the vertices for the below directed acyclic graph using DFS method and Source removal method. 	CO 2	PO 1	8

		c)	Write an algorithm for computing the median using Decrease and Conquer technique.	*CO 2*	*PO 1*	**6**
			UNIT - III			
	3	a)	Discuss Divide and Conquer strategy. Explain Merge sort algorithm with example and give its recurrence relation.	*CO 2*	*PO 1*	**10**
		b)	Apply bottom up heap sort technique to sort the following list of elements. Also write an algorithm for the same. **{ 2, 9, 7, 6, 5, 8}**	*CO 2*	*PO 1*	**10**
			OR			
	4	a)	Strassen's matrix multiplication method is efficient compare to traditional matrix multiplication? Justify the statement with an example scenario.	*CO 1*	*PO 2*	**10**
		b)	Demonstrate all the cases of Horspool pattern matching technique. Apply the technique to search for the pattern "**ALGORITHMS**" in the text "**ANALYSIS AND DESIGN OF ALGORITHMS**". Also find its time efficiency.	*CO 1*	*PO 2*	**10**
			UNIT - IV			
	5	a)	Find the minimum spanning tree for the following graph using Kruskal's algorithm. Also write an algorithm for the same.  	*CO 2*	*PO 1*	**10**
		b)	Solve the following instance of Knapsack by Dynamic programming technique: **Number of objects n = 4** **Weights (W_i)= {2, 3, 4,5}** **Profits (P_i) = {3, 4, 5, 6}** **Knapsack Capacity C=5**	*CO 2*	*PO 1*	**10**
			OR			
	6	a)	Find the transitive closure for the relation R={(2,1),(2,3),(3,1),(3,4),(4,1),(4,3) on set A={1,2,3.4} using Warshall's algorithm. Also write an algorithm for the same and find its time complexity.	*CO 2*	*PO 1*	**10**

		b)	Consider the five-symbol alphabet {A, B, C, D, _ } with the following occurrence frequencies in a text made up of these symbols. **Symbol** | **A** | **B** | **C** | **D** | **_** **Frequency** | **0.35** | **0.1** | **0.2** | **0.2** | **0.15** Construct Huffman tree and generate the code for the symbols. Also write Huffman's algorithm.	***CO 2***	***PO 1***	**10**
			UNIT - V			
	7	a)	Solve the travelling salesman problem for the following graph using Branch and Bound technique.  	***CO 2***	***PO 1***	**10**
		b)	Apply Backtracking technique to find the sum of subsets for the set s={3,5,6,7} and d=15. Draw a state space tree.	***CO 2***	***PO 1***	**10**

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