U.S.N.										

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

Autonomous Institute Affiliated to VTU

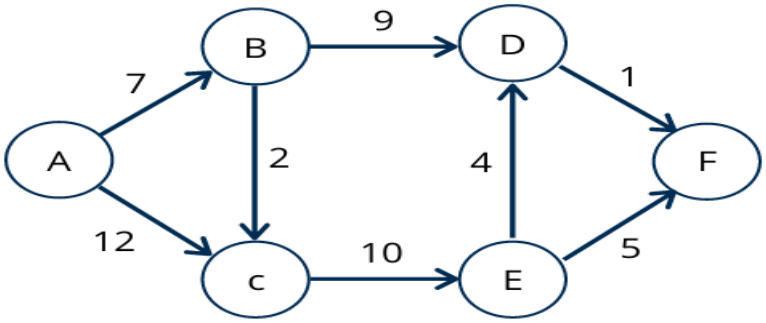
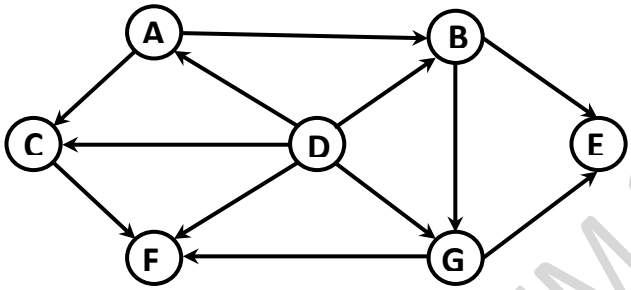
September / October 2023 Semester End Main Examinations

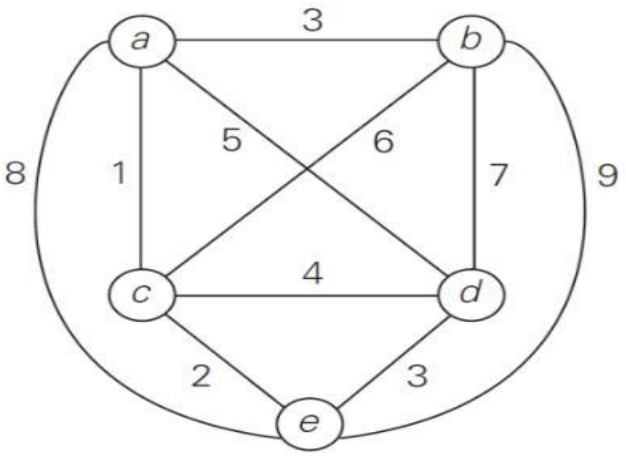
Programme: B.E. **Semester: IV**
Branch: Information Science and Engineering **Duration: 3 hrs.**
Course Code: 22IS4PCADA **Max Marks: 100**
Course: Analysis and Design of Algorithms **Date: 22.09.2023**

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)	i. Design a recursive algorithm for computing 2^n for any nonnegative integer n that is based on the formula: $2^n = 2^{n-1} + 2^{n-1}$ ii. Set up a recurrence relation for the number of additions made by the algorithm and solve it. iii. Draw a tree of recursive calls for this algorithm and count the number of calls made by the algorithm.	*CO3*	*PO3*	**08**
	b)	Discuss the general plan to find the efficiency of recursive algorithms. Apply the same to find the efficiency of solving Tower of Hanoi problem.	*CO1*	*PO1*	**08**
	c)	Apply Master's Theorem for the following i) $T(n) = 2T(n/4) + n$ ii) $T(n) = 8T(n/2) + n^3$	*CO2*	*PO2*	**04**
		UNIT - II			
2	a)	Design an algorithm used to perform partition in Quick Sort. Discuss with recurrences the efficiency of Quick Sort in Best and Worst case.	*CO3*	*PO3*	**08**
	b)	Define Spanning Tree. Discuss with time complexity the Prim's algorithm to construct Minimum Spanning Tree.	*CO1*	*PO1*	**08**
	c)	Design an algorithm to find the position of maximum element in an array using Divide and Conquer. Comment on its time complexity.	*CO3*	*PO3*	**04**
		OR			
3	a)	Write the Bubble Sort algorithm. Find the number of swaps done while sorting the following set of elements in ascending order using Bubble Sort. **6 2 11 7 5**	*CO2*	*PO2*	**08**
	b)	Explain Dijkstra's shortest path algorithm. Using the same, find the shortest path from vertex A to the remaining vertices.	*CO2*	*PO2*	**12**

						
			UNIT - III			
4	a)		Write algorithms to perform DFS and BFS traversal. Apply DFS method to find the topological order for the graph given below. 	*CO3*	*PO3*	**12**
	b)		Write the Horspool's algorithm. How many character comparisons will be made using Horspool's algorithm in searching for each of the following patterns in a text of 1000 A's? i) AAAAB ii) BAAAA	*CO2*	*PO2*	**08**
			OR			
5	a)		Write the Johnson Trotter algorithm for generating permutations. Apply the same for an input {5,6,7,8}.	*CO2*	*PO2*	**08**
	b)		With Pseudocode, discuss Horspool's String matching algorithm and analyze its time complexity.	*CO2*	*PO2*	**08**
	c)		Design an algorithm to compute the value of the smallest element in a given array using Decrease and Conquer. Comment on its time complexity.	*CO3*	*PO3*	**04**
			UNIT – IV			
6	a)		Write the algorithm for computing binomial coefficient C(n,k) using dynamic programming approach. Draw the binomial coefficient table for C(8, 3).	*CO2*	*PO2*	**08**
	b)		Design an algorithm to construct a max heap using bottom up approach. Trace by applying the same to sort the following elements **S O R T I N G**	*CO3*	*PO3*	**12**

			UNIT – V			
	7	a)	Consider the graph given below representing an instance of TSP, where source vertex is **"a"**. Solve the problem instance using Branch and Bound technique.  	*CO2*	*PO2*	**08**
		b)	Differentiate between promising and non-promising node. Construct the state-space tree using backtracking strategy to solve the following instance of the subset sum problem: A = {1,3,5,8,9} and Sum = 12	*CO3*	*PO3*	**08**
		c)	Define NP, NP-complete class of problems with examples.	*CO1*	*PO1*	**04**

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