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

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**

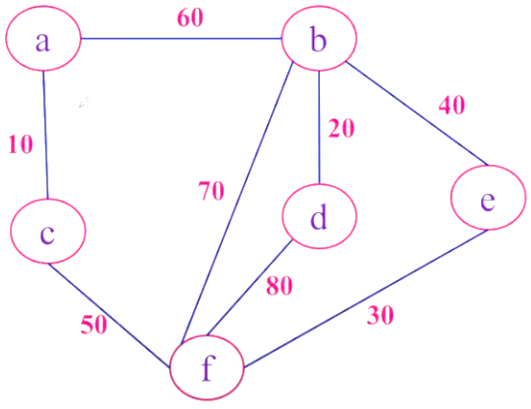
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

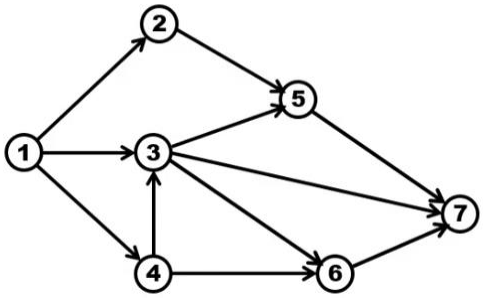
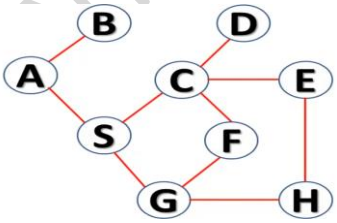
Course Code: 24AM4PCDAA **Max Marks: 100**

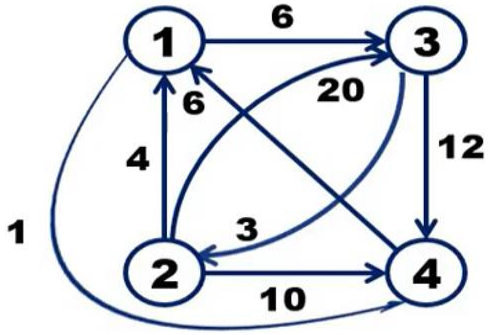
Course: Design and Analysis of Algorithms

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)	Illustrate the steps involved in algorithm design and analysis process with a neat flowchart.	1	2	**6**
	b)	i. Explain the general steps for analyzing the efficiency of a recursive algorithm. ii. Develop an algorithm to find a factorial of a given number using recursive procedure and derive its efficiency.	2	3	**8**
	c)	Write an algorithm to find uniqueness of elements in an array and give the mathematical analysis of this using non recursive algorithm with steps.	1	2	**6**
		UNIT – II			
2	a)	Write and illustrate the working of the quicksort algorithm. Apply the quicksort technique to sort the following array elements: 54 | 26 | 93 | 17 | 77 | 31 | 44 | 55 | 20	1	3	**10**
	b)	List the steps involved in Prim's algorithm. Consider the following graph depicted in Figure 2b, find the minimum spanning tree using Prim's algorithm:  Figure 2b	2	3	**10**

			UNIT – III			
	3	a)	i. Differentiate between Breadth First Search (BFS) and Depth First Search (DFS). ii. Define Topological sorting. Illustrate the Topological sorting using single source removal method for the following graph shown in Figure 3a:  Figure 3a	*1*	*2*	**10**
		b)	i. Define Hashing. Describe any two collision resolution techniques. ii. Apply linear probing technique for the keys 1, 3, 12, 4, 25, 6, 18, 20 and 8 are inserted into empty hash table of length 10 using open addressing with hash function H(i) = i^2 mod 10. Write the resultant hash table and find maximum probe value.	*3*	*3*	**10**
			OR			
	4	a)	Write Breadth First Search (BFS) algorithm and apply the same for the given graph shown in Figure 4a. Also mention the shortest path from the source node A.  Figure 4a	*1*	*2*	**10**
		b)	i. Design and explain Horspool's algorithm for enhancement of string matching in detail. ii. Apply Horspool's algorithm to find the pattern: A T G T A in the string: G T A C T A G A G G A C G T A T G T A C T G.	*3*	*3*	**10**
			UNIT – IV			
	5	a)	i. Describe the three major variations of Transform and Conquer technique. ii. Construct a 2-3 tree by successive insertion for the following list: 9, 5, 8, 3, 2, 4, 7.	*3*	*3*	**10**
		b)	Develop an algorithm to solve Knapsack problem using Greedy approach and apply the same to find optimal solution to the knapsack instance: n = 4, m = 8, P = {1, 2, 5, 6} and W = {2, 3, 4, 5}.	*3*	*3*	**10**

			OR			
	6	a)	Apply Floyd's algorithm to find all pairs shortest path for the following graph indicated in Figure 6a.  Figure 6a	*2*	*3*	**10**
	6	b)	Illustrate the following with an example. Also mention any two applications of these techniques. i. Presorting ii. Binomial Co-efficient.	*1*	*2*	**10**
			UNIT - V			
	7	a)	Solve the following assignment problem using Branch and Bound technique to find optimal solution. Also explain a step by step solving procedure for the same.	*3*	*3*	**10**

	Job1	**Job2**	**Job3**	**Job4**
Person A	9	2	7	8
Person B	6	4	3	7
Person C	5	8	1	8
Person D	7	6	9	4

		b)	Describe the following with an example: i. Nondeterministic algorithm ii. NP Problem iii. NP Complete Problem.	*3*	*2*	**10**

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