U.S.N.										

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

Autonomous Institute Affiliated to VTU

February 2025 Semester End Main Examinations

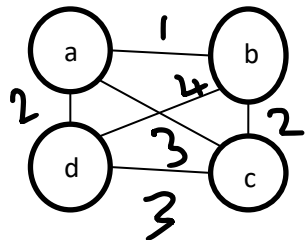
Programme: B.E. **Semester: IV**

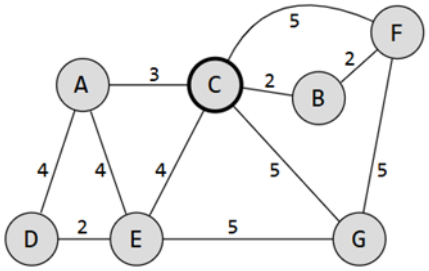
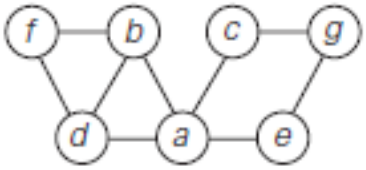
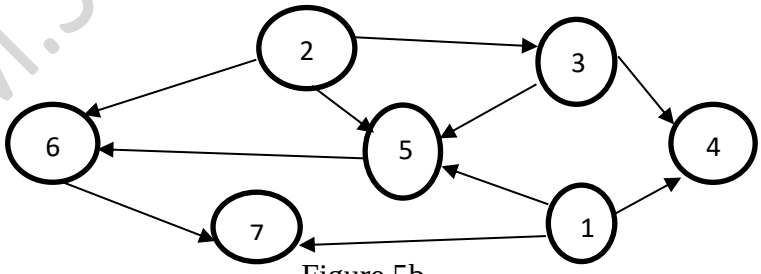
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

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.

		UNIT - I	CO	PO	Marks
1	a)	Explain Asymptotic notations with suitable examples.	CO1	PO1	**10**
	b)	Give the mathematical analysis of Non-recursive Matrix multiplication algorithm	CO1	PO1	**4**
	c)	Illustrate the steps involved in algorithm design and analysis process with a neat flowchart.	CO1	PO1	**6**
		OR			
2	a)	Describe the various characteristics of an algorithm.	CO1	PO1	**5**
	b)	Provide the general plan for analyzing Time efficiency of Recursive algorithms and analyze the Tower of Hanoi Recursive algorithm.	CO1	PO2	**10**
	c)	Elaborate on the general plan for analyzing the time efficiency of recursive algorithm.	CO1	PO1	**5**
		UNIT - II			
3	a)	Apply Quick sort algorithm to sort the array 20, 2, 9, 7, 12, 15, 1, 6, 8.	CO2	PO2	**5**
	b)	Sort the given array 21, 10, 7, 15, 12, 19, 2, 5 using Merge sort algorithm.	CO2	PO2	**5**
	c)	i. Write the Prim's algorithm. Give an example. ii. Apply Kruskal's algorithm to find minimal Spanning tree for the graph shown in Figure 3c.  Figure 3c	CO2	PO2	**10**

			OR			
	4	a)	Solve the recurrence relation T(n)= 2T(n/2) +cn using master theorem.	*CO2*	*PO1*	**6**
		b)	Using Dijkstra's algorithm find the shortest paths from vertex C in the given graph shown in Figure 4b.  Figure 4b	*CO2*	*PO2*	**10**
		c)	Highlight the various applications of Minimum Spanning Tree (MST).	*CO2*	*PO1*	**4**
			UNIT - III			
	5	a)	i. List various applications of Breadth First Search (BFS) and Depth First Search (DFS). ii. Apply Breadth First Search (BFS) for the graph shown in Figure 5a and provide its time complexity.  Figure 5a	*CO2*	*PO2*	**10**
		b)	Obtain the Topological sort for the graph shown in Figure 5b using the following: i) Source removal method ii) DFS method.  Figure 5b	*CO2*	*PO2*	**10**
			OR			
	6	a)	i. Write Horspool algorithm. ii. Identify the pattern in a string using Horspool algorithm. String: G T A C T A G A G G A C G T A T G T A C T G Pattern: A T G T A	*CO2*	*PO2*	**10**
		b)	Illustrate Permutation algorithms for generating Combinatorial objects with appropriate example.	*CO2*	*PO2*	**5**

		c)	Describe any two collision resolution techniques in hashing.	*CO1*	*PO1*	**5**
			UNIT - IV			
	7	a)	i. Outline the properties of 2-3 tree. ii. Construct a 2-3 tree by successive insertion for the following list: 6, 5, 1, 9, 7, 8, 10.	*CO2*	*PO2*	**10**
		b)	i. Write Heapsort algorithm. Also give an example. ii. Apply heapsort for the given set of nodes elements 4, 3, 7, 1, 8, 5 using Bottom-up approach.	*CO2*	*PO2*	**10**
			OR			
	8	a)	Apply Floyd's algorithm to find all pairs shortest path for the given adjacency matrix shown in Table 8a.	*CO3*	*PO2*	**10**

	C1	C2	C3	C4
R1	0	3	∞	7
R2	8	0	2	∞
R3	5	∞	0	1
R4	2	∞	∞	0

Table 8a

		b)	Apply Dynamic programming technique to the following instance of the Knapsack problem with Knapsack capacity M =10. Also indicate each step used in computing the same.	*CO3*	*PO2*	**10**

Item	Weight	Value
1	7	42
2	3	12
3	4	40
4	5	25

			UNIT - V			
	9	a)	Using the Branch and Bound algorithm, solve the Travelling Salesman Problem (TSP) for the graph shown in Figure 9a.	*CO3*	*PO2*	**10**

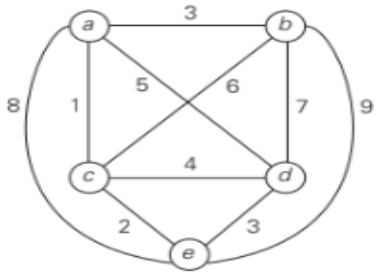


Figure 9a

		b)	Apply Branch and Bound approach to solve the instance of 0/1 Knapsack problem. Knapsack capacity M=10. Also write the steps associated with it.	*CO3*	*PO2*	**10**

Items	1	2	3	4
Weight	4	7	5	3
Value	$40	$42	$25	$12

<table>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>a)</td><td>Obtain the optimal solution for assignment problem given below:

<table><tr><td></td><td>Job 1</td><td>Job 2</td><td>Job 3</td><td>Job 4</td></tr><tr><td>Person 1(A)</td><td>11</td><td>4</td><td>9</td><td>10</td></tr><tr><td>Person 2(B)</td><td>8</td><td>6</td><td>5</td><td>9</td></tr><tr><td>Person 3(C)</td><td>7</td><td>10</td><td>3</td><td>10</td></tr><tr><td>Person 4(D)</td><td>9</td><td>8</td><td>11</td><td>6</td></tr></table></td><td>CO3</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain the concept of sum of subset with suitable example.</td><td>CO3</td><td>PO1</td><td>5</td></tr>
<tr><td></td><td></td><td>c)</td><td>Comprehend on N queens problem with relevant example.</td><td>CO3</td><td>PO1</td><td>5</td></tr>
</table>

****