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NBA Accredited (UG - 6Years)

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ARMAN SINGH BHATI 1RV22IS015

Department of Computer Science and Engineering

Program: BE

Date	18 June 2024	Maximum Marks	50
Course Code	**CD343AI**	Duration	90 min
4th Sem	IV Semester	CIE-I	

Design and Analysis of Algorithms

(Common to AIML/CSE/CD/CY/ISE)

Sl. No.	Test Questions	M	L	CO
1a	Summarise the framework for analysis of algorithms.	05	L1	CO2
1b	With suitable notations and graphs, explain the different asymptotic notations. Give two examples in each case.	05	L2	CO1
2a	Design a recursive algorithm to find the sum of cubes of first 'n' natural numbers. Set up a recurrence, solve and determine the time complexity of the algorithm.	05	L2	CO1
2b	Write an algorithm to arrange the numbers in ascending order using Selection Sort. Evaluate the time complexity. Compare it with merge-sort algorithm.	05	L1	CO3
3a	Sort the following functions in the increasing order of growth. n^3, 2^n, $log_5 n$, $3n$, $log_2 n$, $\sqrt{n}$, $n \log n$ Indicate how much the functions value will change if its argument is increased four-fold.	05	L2	CO2
3b	Write the pseudocode for merge sort and describe the process. Setup a recurrence and decide the time complexity.	05	L2	CO1
4a	Apply Master's theorem to following recurrence and indicate the efficiency class. $i. T(n) = 2T\left(\frac{n}{2}\right) + n$ $ii. T(n) = 8T\left(\frac{n}{2}\right) + 5n^2$	04	L3	CO1
4b	Derive the worst-case efficiency class for the quick sort. Show the first split for the following array by considering the leftmost element as the pivot: 38, 81, 22, 48, 18, 50, 31, 58	06	L3	CO2
5a	Mention the 3 variations of decrease-and-conquer and give an example algorithm in each case.	04	L1	CO3
5b	Consider the graph shown in Fig 5b. i. Apply DFS algorithm by considering vertex '1' as the source and write the traversal sequence. Show the contents of stack during DFS and also draw the DFS forest.	06	L3	CO3

ii. Apply BFS algorithm by considering vertex '0' as the source. Draw the BFS forest.

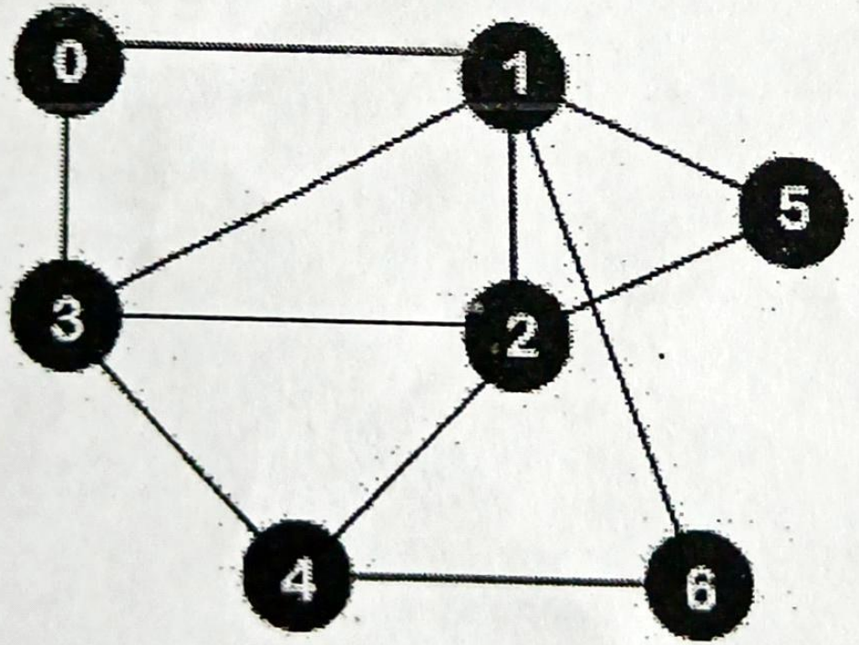


Fig 5b

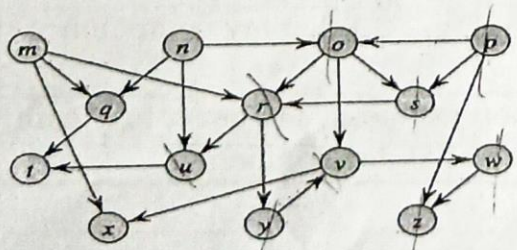
Course Outcomes

CO1	Apply knowledge of computing and mathematics to algorithm analysis and design
CO2	Analyze a problem and identify the computing requirements appropriate for solution

Date	July 2024	Maximum Marks	10+50
Course Code	**CD343AI**	Duration	120 min
Sem	IV	CIE-II	

Design and Analysis of Algorithms

(Common to AIML/CSE/CD/CY/ISE)

Sl. No.	Questions	M	L	CO
	PART A			
1.1	Is it possible to find transitive closure of a digraph using Depth First Search (DFS) or Breadth-first search (BFS)? Justify the answer	**2**	L3	CO2
1.2	Given a text of length n=30 and a pattern of length m=4, how many shifts will the Horspool algorithm perform in the worst case?	**2**	L3	CO2
1.3	In a max heap containing n elements, the smallest element can be found in _____ worst time	**2**	L1	CO1
1.4	Why Floyd-Warshall Algorithm better for Dense Graphs and not for Sparse Graphs?	**2**	L3	CO2
1.5	List any four limitations of Distribution Counting Sort	**2**	L2	CO1
	PART B			
1a	Apply DFS traversal to find the topological order of the graph shown in figure 1a from the vertex p (break the ties by the alphabetical order of the vertices)  figure 1a	**06**	L3	CO3
1b	Compare the brute force approach and Instance simplification variant of transform and conquer approach to solve checking element uniqueness in an array.	**04**	L1	CO1

2a	Show the state of each pass and final array after applying comparison counting sort for the list: 94, 73, 26, 11, 05, 77, 31 to sort the elements in non-decreasing order.	**06**	L2
2b	Write the pseudocode of Warshall's algorithm and prove that the time efficiency of warshall's algorithm is cubic.	**04**	L2
3a	Apply heapsort to arrange the list 8, 12, 15, 3, 5, 1, 43, -7 in ascending order by using array representation of heap.	**06**	L3
3b	Compute binomial coefficient of $^5C_3$ using dynamic programming	**04**	L2
4	Apply floyd's algorithm to find all pairs shortest path for the digraph shown in with the weight matrix $\begin{pmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{pmatrix}$	**10**	L3
5	Use input enhancement technique for the pattern **RNARNAKARNA** and apply Boyer Moore algorithm to find the occurrence of this pattern in the text **RAVANAKARNA_RAMAYANA_EPIC _SEETHA_ _ _ _NNARNA_ RNARNAKARNA**	**10**	L3

Course Outcomes

CO1	Apply knowledge of computing and mathematics to algorithm analysis and desig
CO2	Analyze a problem and identify the computing requirements appropriate for solution
CO3	Apply mathematical foundations, algorithmic principles, and computer scier theory to the modeling, and evaluation of computer-based solutions in a way th demonstrates comprehension of the trade-offs involved in design choices.

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AMAN SINGH BHOJ 1RV22CY011 24578

Department of Computer Science and Engineering

Program: BE

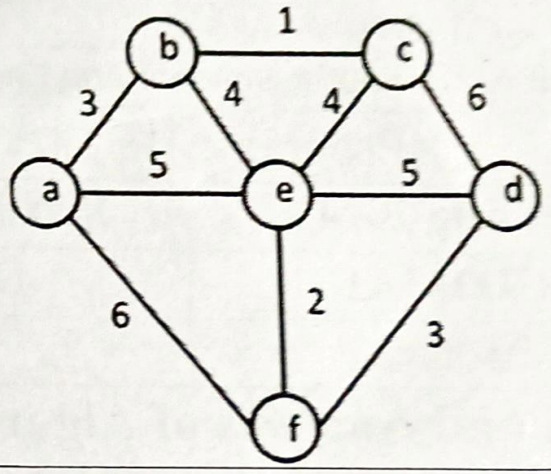
Date	26 Aug 2024	Maximum Marks	60
Course Code	**CD343AI**	Duration	90 min
4th Sem	IV Semester	CIE-I	

Design and Analysis of Algorithms

(Common to AIML/CSE/CD/CY/ISE)

Sl. No.	Improvement Quiz Questions	M	L
1	Define spanning tree.	2	1
2	Find the compression ratio for the given data A = 8 = 40%, B = 2 = 10%, C = 4 = 20%, D = 3 = 15% , _ = 3 = 15% Using Huffman coding the characters are coded as A 0 B 100 C 110 D 101 _ 111	2	2
3	Explain how Dijkrasta's algorithm differ from Prim's algorithm	2	2
4	Define a state-space tree in the context of the backtracking algorithm	2	1
5	What is NP hard problems?	2	1

Sl. No.	Improvement Test Questions	M	L
1	Apply 0/1 Knapsack, find the maximum profit for the given data **C= 5 Wi 2 1 3 2** **Pi 8 6 16 11**	10	3
2	Apply Prim's algorithm to find the Minimum Spanning Tree (MST) for the given graph. Write the spanning tree after finding the MST	10	3



3 a	Compare Backtracking and Branch & bound.	4	2	2
3 b	Write the decision tree for finding minimum of three numbers.	6	2	1
4	Consider an assignment problem where you have to assign n people to n jobs in such a way that the total cost of the assignment is minimized. The cost matrix for assigning each person to each job is given below: **Job/Person** | **Job 1** | **Job 2** | **Job 3** | **Job 4** Person 1 | 9 | 2 | 7 | 8 Person 2 | 6 | 4 | 3 | 7 Person 3 | 5 | 8 | 1 | 8 Person 4 | 7 | 6 | 9 | 4 (a) Calculate the lower bound for this assignment problem. (b) Find the solution using branch and bound	10	3	3
5 a	Briefly discuss P and NP problems used in problem solving	6	2	2
5 b	Define greedy technique, how it differs from dynamic programming?	4	2	1