



Course Code	: 2101CS401	Date	: 18-10-2023
Course Name	: Design and Analysis of Algorithm	Duration	: 150 Minutes
		Total Marks	: 70

Instructions:

1. Attempt all the questions.
2. Figures to the right indicates maximum marks.
3. Make suitable assumptions wherever necessary.

Q.1 (A) Discuss various the asymptotic notations used for best case average case and worst case analysis of algorithms. **4**

(B) Apply the Insertion sort algorithm to sort the following numbers. **3**
34, 18, 65, 32, 51, 21

OR

Apply the Heap sort algorithm to sort the following numbers.
34, 18, 65, 32, 51, 21

(C) Write an algorithm for selection sort. Analyze insertion sort algorithm for best case and worst case. **7**

OR

What is an amortized analysis? Explain aggregate method of amortized analysis using suitable example

Q.2 (A) Explain master theorem and solve the recurrence $T(n)=9T(n/3)+n$ with master method. **4**

(B) Find the multiplication of 981 and 1234 using divide and conquer method. **3**

OR

Arrange the following numbers in ascending order using quick sort algorithm.
44, 75, 23, 43, 55, 12, 64, 77, 33

(C) Explain merge sort algorithm with suitable example. **7**

OR

Solve following recurrence relation using iterative method.
 $T(n) = 2T(n/2) + n$

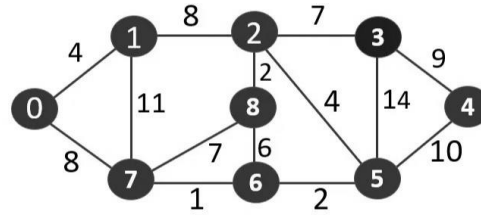
Q.3 (A) Explain general characteristics of greedy algorithms **4**

(B) Find an optimal Huffman code for the following set of frequency. a: 50, b: 20, c: 15, d: 30. **3**

OR

Using greedy algorithm find an optimal schedule for following jobs with $n=5$
Profits: $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 5, 1)$ and
Deadline: $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$.

- (C) What is a minimum spanning tree? Evaluate Prim's algorithm for the following graph to get MST. Show the intermediate steps. 7



OR

State the Greedy Knapsack? Evaluate the knapsack problem Greedy method.

$n=7, M=15,$

$(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3),$

$(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$

- Q.4 (A) What are the advantages of dynamic programming over greedy method? 4
- (B) Find longest common subsequence of following two strings, using dynamic programming. X= LONGEST and Y = STONE 3

OR

Solve the following making change problem using dynamic programming method: Amount = Rs. 10 and Denominations: (Rs. 1, Rs. 2 and Rs. 4)

- (C) Using dynamic programming find out the optimal sequence for the matrix chain multiplication of $A_1 [2 \times 3], A_2 [3 \times 5], A_3 [5 \times 2], A_4 [2 \times 4]$ and $A_5 [4 \times 3]$ matrices. 7

OR

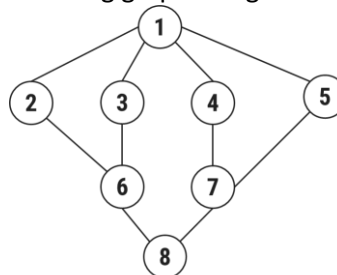
Solve the following 0/1 Knapsack Problem using Dynamic Programming.

There are four items whose weights and values are given in following arrays.

Weight $w[] = \{5, 4, 6, 3\}$ Value $v[] = \{10, 40, 30, 50\}$ Show your equation and

find out the optimal knapsack items for weight capacity of 10 units.

- Q.5 (A) Define P, NP, NP-complete and NP-hard problems 4
- (B) Define DFS. Traverse the following graph using breadth first search algorithm. 3



OR

What is finite automata? List out Five-tuples of finite automata.

- (C) Explain rabin-karp string matching algorithm. Working modulo $q = 11$. How many spurious hits does the Rabin Karp matcher encounter in the text $T = 3541592653589792$ when looking for the pattern $P = 26$? 7

OR

Explain Backtracking Method. What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method.
