

Time: 3 Hours

Marks: 80

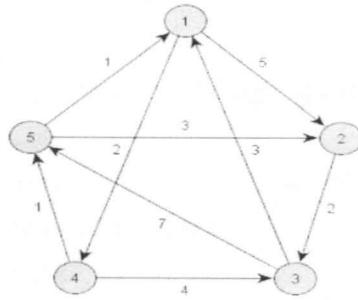
N.B

- (1) Question no. 1 is compulsory.
- (2) Attempt any 3 from the remaining questions.
- (3) Assume suitable data if necessary.
- (4) Figures to right indicate full marks.



- Q.1 a. Consider the instance of knapsack problem where  $n=6$ ,  $M=15$ , Profits are  $(P_1, P_2, P_3, P_4, P_5, P_6) = (1, 2, 4, 4, 7, 2)$  and weights are  $(W_1, W_2, W_3, W_4, W_5, W_6) = (10, 5, 4, 2, 7, 3)$ . Find Max Profit using Fractional Knapsack. 08
- b. Compute worst case complexity of following program segment 02
- ```
sum = 0;
for( i = 0; i < n; i++ )
    for( j = 0; j < i; j++ )
        sum++;
```
- c. Write Quicksort algorithm using Divide and Conquer approach. Derive its complexity for all the three cases. 10
- Q.2 a. Explain Divide and Conquer approach. Write a recursive algorithm to determine the max and min from given elements and explain. 20
- Derive the time complexity of this algorithm and compare it with a simple brute force algorithm for finding max and min.
- For the following list of elements trace the recursive algorithm for finding max and min and determine how many comparisons have been made.
- 22, 12, -5, -8, 15, 60, 17, 31, 47
- Q.3 a. What is optimal binary search tree? Let  $n = 3$  and  $\{a_1, a_2, a_3\} = \{\text{do, if, while}\}$ . Let  $p(1:3) = \{0.5, 0.1, 0.05\}$  and  $q(0:3) = \{0.15, 0.1, 0.05, 0.05\}$ . Compute and construct OBST for above value using Dynamic Programming. 12
- b. Solve 8 puzzle problem by Branch and Bound. Draw State space tree. 08
- |   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 5 | 6 |   |
| 7 | 8 | 4 |
- Initial state
- |   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 5 | 8 | 6 |
| 7 | 4 |   |
- Final State
- Q.4 Write and Explain the algorithm to compute all pair source shortest path using dynamic programming and prove that it is optimal. 20
- For the following graph determine the all pairs source shortest path

TURN OVER



- Q.5 a. Write an algorithm to determine the sum of subsets for a given Sum and a Set of numbers. Draw the tree representation to solve the subset sum problem given the numbers set as {3,5,6,7,2} with sum = 15. Derive all the subsets. Comment on the complexity of the algorithm. 15
- Q.5 b. An algorithm takes 0.5ms for input size 100. How long will it take for an input size 500. If the running time is following  
 1) Linear 2) Quadratic 3) Cubic 4)  $\sqrt{n}$  5)  $n \log_2 n$  05
- Q.6 A Explain the idea behind backtracking? Write an algorithm for N-queen problem. Draw state space tree for 4-queen problem. 12
- b What is LCS? Find LCS for string S = "ABAZDC" and T = "BACBAD" 08

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