

**Maulana Azad National Urdu University**

**B. Tech : V Semester : (Special Examination) July 2018**

**Paper - BTCS502PCT : Design Analysis and Algorithm**

**Total Marks: 70**

**Time Duration: 3 Hrs**

**Part-A**

1. **Attempt all questions. Each question carries equal marks. 10\*1 = 10**
- i. The binary search algorithm uses  
A. Linear way to search values    B. Divide and conquer method  
C. Bubble sorting technique    D. None of them
- ii. An algorithm is a \_\_\_\_\_ set of precise instructions for performing computation.  
A. Infinite    B. Finite    C. Constant    D. None of the mentioned
- iii. Which of the following standard algorithms is not Dynamic Programming based.  
A. Bellman–Ford Algorithm for single source shortest path  
B. Floyd Warshall Algorithm for all pairs shortest paths  
C. 0-1 Knapsack problem  
D. Prim's Minimum Spanning Tree
- iv. We use dynamic programming approach when  
A. It provides optimal solution  
B. The solution has optimal substructure  
C. The given problem can be reduced to the 3-SAT problem  
D. It's faster than Greedy
- v. Consider a job scheduling problem with 4 jobs  $J_1, J_2, J_3, J_4$  and with corresponding deadlines:  $(d_1, d_2, d_3, d_4) = (4, 2, 4, 2)$ . Which of the following is not a feasible schedule without violating any job schedule?  
A.  $J_3, J_4, J_1, J_3$     B.  $J_4, J_2, J_1, J_3$     C.  $J_4, J_1, J_2, J_3$     D.  $J_4, J_2, J_3, J_1$
- vi. If we choose Prim's Algorithm for uniquely weighted spanning tree instead of Kruskal's Algorithm, then  
A. we'll get a different spanning tree    B. we'll get the same spanning tree  
C. spanning will have less edges    D. spanning will not cover all vertices
- vii. Which of the following is not a backtracking algorithm?  
A. Knight tour problem    B. N queen problem  
C. Tower of Hanoi    D. M coloring problem

- viii. What is the complexity of n queen problem?  
 A.  $O(N!)$       B.  $O(N^2)$       C.  $O(N^3)$       D. None
- ix. Who had invented Branch and Bound Technique?
- x. What is Live node?

### Part-B

**Attempt any five questions. Each question carries equal marks.**

**6\*5 = 30**

2. Illustrate  $\Theta$  notation. Find the  $\Theta$  notation for the following function:  
 $f(n) = 30n^2 + 16n + 25$
3. Illustrate the operation of merge sort on the given array:
- |    |    |    |    |    |    |    |    |    |    |   |    |    |
|----|----|----|----|----|----|----|----|----|----|---|----|----|
| 86 | 76 | 45 | 92 | 29 | 41 | 42 | 12 | 19 | 93 | 3 | 50 | 11 |
|----|----|----|----|----|----|----|----|----|----|---|----|----|
4. Find the optimal solution to the knapsack problem instance  $n = 3$ ,  $M = 20$ ,  $P_1, P_2, P_3 = 13, 8, 6$  and  $w_1, w_2, w_3 = 19, 13, 9$ .
5. There are five jobs whose profits  $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 1, 6)$  and the deadlines =  $(2, 2, 1, 3, 3)$ . Find the optimal solution that maximizes profit on scheduling these jobs.
6. What do you mean by Multistage Graphs? Elaborate the concept of Multistage Graph with one example.
7. Solve the 0/1 knapsack problem instance with 5 objects and a capacity  $M = 11$ ,  $P = (5, 4, 7, 2, 3)$  and weights  $W = (4, 3, 6, 2, 2)$
8. Find a solution to the 4-Queens problem using branch and bound strategy.
9. What is branch and Bound? Write the applications of Branch and Bound problem.

### Part-C

**Attempt any three questions. Each question carries equal marks.**

**10\*3 = 30**

10. What is sum-of-subsets problem? Write a recursive backtracking algorithm for sum of subsets problem.
11. What is TSP problem? Explain the TSP problem using Branch and Bound with one example.

12. Write the Differentiate between greedy method and dynamic programming. Explain the Kruskal's algorithm with an example.
13. What is an algorithm? Write an algorithm for quick sort. Explain with an example.
14. Solve the Travelling Salesperson Problem (TSP) for the given graph using dynamic programming.

