Design & Analysis of Algorithms

UNIT-3

Part-A: Multiple Choice Questions (20 × 1 = 20 Marks)

Choose the correct answer.

1. Dynamic Programming is mainly used to solve problems that exhibit:

a) Recursion only
b) Overlapping subproblems and optimal substructure
c) Sorting property
d) Divide and Conquer only

2. Dynamic Programming stores the solutions of subproblems in:

a) Queue
b) Stack
c) Table/Memory
d) Linked List

3. Which of the following is NOT an application of Dynamic Programming?

a) 0/1 Knapsack Problem
b) Optimal Binary Search Tree
c) Traveling Salesperson Problem
d) Binary Search

4. The main advantage of Dynamic Programming is:

a) Increases recursion
b) Avoids repeated computations
c) Increases memory usage
d) Reduces input size

5. In Dynamic Programming, solving smaller subproblems first is called:

a) Top-down approach
b) Bottom-up approach
c) Greedy approach
d) Branch and Bound

6. An Optimal Binary Search Tree minimizes:

a) Tree height only
b) Number of nodes
c) Expected search cost
d) Memory usage

7. The Optimal Binary Search Tree is constructed based on:

a) Key frequencies
b) Number of vertices
c) Edge weights
d) Heap property

8. In a Binary Search Tree, keys in the left subtree are:

a) Greater than root
b) Equal to root
c) Less than root
d) Random

9. The 0/1 Knapsack Problem involves:

a) Fractional selection of items
b) Selecting all items
c) Either selecting an item completely or not selecting it
d) Sorting items

10. In the 0/1 Knapsack Problem, the objective is to maximize:

a) Weight
b) Capacity
c) Profit
d) Number of items

11. Which parameter restricts item selection in the Knapsack Problem?

a) Profit
b) Weight capacity
c) Number of items
d) Value

12. Floyd-Warshall Algorithm is used for:

a) Single Source Shortest Path
b) Minimum Spanning Tree
c) All Pairs Shortest Path
d) Graph Coloring

13. Floyd-Warshall Algorithm works on:

a) Directed weighted graphs
b) Unweighted trees
c) Linked Lists
d) Heaps

14. Traveling Salesperson Problem (TSP) aims to:

a) Visit some cities
b) Visit every city exactly once and return to the starting city
c) Find the shortest edge
d) Construct a tree

15. TSP seeks a:

a) Hamiltonian Path
b) Hamiltonian Cycle with minimum cost
c) Spanning Tree
d) Binary Tree

16. Reliability Design Problem aims to:

a) Minimize system reliability
b) Maximize system reliability
c) Minimize memory
d) Sort components

17. Dynamic Programming typically improves efficiency by:

a) Increasing recursion depth
b) Storing intermediate results
c) Ignoring subproblems
d) Sorting data

18. Which of the following is an example of optimal substructure?

a) Merge Sort
b) Knapsack Problem
c) Linear Search
d) Bubble Sort

19. Dynamic Programming is most suitable when subproblems:

a) Are independent
b) Overlap repeatedly

c) Are unsorted
d) Are unrelated

20. Which technique is often combined with Dynamic Programming to store solutions?

a) Memoization
b) Traversal
c) Partitioning
d) Hashing only

Part-B: Fill in the Blanks (20 × 1 = 20 Marks)

1. Dynamic Programming was developed by _____.

2. Dynamic Programming is applicable when problems exhibit optimal _____.

3. Repeated occurrence of subproblems is called _____ subproblems.

4. The process of storing computed results is called _____.

5. Dynamic Programming avoids _____ computations.

6. An Optimal Binary Search Tree minimizes the expected search _____.

7. OBST construction depends on key access _____.

8. In a Binary Search Tree, the right subtree contains keys _____ than the root.

9. In the 0/1 Knapsack Problem, an item is either selected or _____.

10. The objective of the Knapsack Problem is to maximize total _____.

11. The capacity of the knapsack acts as a _____.

12. Floyd-Warshall Algorithm solves the _____ shortest path problem.

13. Floyd-Warshall Algorithm computes shortest paths between all pairs of _____.

14. Traveling Salesperson Problem is commonly abbreviated as _____.

15. In TSP, the salesperson must return to the _____ city.

16. TSP seeks the minimum cost _____.

17. Reliability Design aims to maximize system _____.

18. Dynamic Programming follows either a top-down or _____ approach.

19. Memoization is commonly used in the _____ approach.

20. Tabulation is commonly used in the _____ approach.

ANSWERS

Part-A: MCQs

1. b
2. c
3. d
4. b
5. b
6. c
7. a
8. c
9. c
10. c
11. b
12. c
13. a
14. b
15. b
16. b
17. b
18. b
19. b
20. a

Part-B: Fill in the Blanks

1. Richard Bellman
2. Substructure
3. Overlapping
4. Memoization
5. Repeated
6. Cost
7. Frequencies
8. Greater
9. Rejected
10. Profit
11. Constraint
12. All Pairs

13. Vertices
14. TSP
15. Starting
16. Tour
17. Reliability
18. Bottom-up
19. Top-down
20. Bottom-up