

## Design & Analysis of Algorithms

### UNIT-5

#### Part-A: Multiple Choice Questions ( $20 \times 1 = 20$ Marks)

Choose the correct answer.

1. Branch and Bound is primarily used for:
  - a) Sorting problems
  - b) Optimization problems
  - c) Searching arrays only
  - d) Traversing trees
2. The Branch and Bound technique systematically explores:
  - a) All solutions randomly
  - b) Solution space tree
  - c) Heap structure only
  - d) Linked lists
3. In Branch and Bound, "Branch" refers to:
  - a) Eliminating nodes
  - b) Dividing the problem into subproblems
  - c) Sorting data
  - d) Calculating shortest paths
4. In Branch and Bound, "Bound" refers to:
  - a) Limiting the search using cost estimates
  - b) Creating branches
  - c) Traversing graphs
  - d) Storing solutions
5. Which problem is commonly solved using Branch and Bound?
  - a) Binary Search
  - b) Traveling Salesperson Problem
  - c) Merge Sort
  - d) Heap Sort
6. The objective of the Traveling Salesperson Problem (TSP) is to:

- a) Visit some cities
- b) Visit all cities exactly once and return to the start
- c) Construct a spanning tree
- d) Color a graph

7. The 0/1 Knapsack Problem aims to:

- a) Minimize weight only
- b) Maximize profit within capacity constraints
- c) Sort items by weight
- d) Minimize profit

8. In the 0/1 Knapsack Problem, an item can be:

- a) Partially selected
- b) Either selected completely or not selected
- c) Repeated multiple times
- d) Divided into fractions

9. LC Branch and Bound stands for:

- a) Least Cost Branch and Bound
- b) Linear Cost Branch and Bound
- c) Lowest Complexity Branch and Bound
- d) Limited Cost Branch and Bound

10. FIFO Branch and Bound uses:

- a) Stack
- b) Queue
- c) Heap
- d) Tree

11. LC Branch and Bound typically uses:

- a) Priority Queue
- b) Linked List
- c) Array only
- d) Stack

12. The solution space of Branch and Bound is represented using a:

- a) Binary Heap
- b) Solution Space Tree
- c) Linked List
- d) Graph Matrix

13. A node that cannot lead to a better solution is:

- a) Expanded
- b) Pruned
- c) Sorted
- d) Merged

14. NP stands for:

- a) Non-Polynomial
- b) Non-deterministic Polynomial time
- c) New Polynomial
- d) Numerical Polynomial

15. A deterministic algorithm produces:

- a) Different outputs for the same input
- b) Exactly one sequence of computation for a given input
- c) Random outputs
- d) Multiple solutions simultaneously

16. A non-deterministic algorithm can:

- a) Explore multiple computational paths conceptually
- b) Sort faster than  $O(n)$
- c) Avoid computations
- d) Eliminate recursion

17. Every NP-Complete problem is:

- a) In P
- b) In NP and NP-Hard
- c) Unsolvable
- d) Deterministic

18. NP-Hard problems are:

- a) At least as hard as NP problems
- b) Easier than NP problems
- c) Only graph problems
- d) Only optimization problems

19. Cook's Theorem proved that:

- a) TSP is solvable in polynomial time
- b) SAT is NP-Complete

- c) Knapsack is NP-Hard
- d) BFS is optimal

20. Which of the following is an NP-Complete problem?

- a) Binary Search
- b) Merge Sort
- c) Boolean Satisfiability (SAT)
- d) Heap Sort

Part-B: Fill in the Blanks ( $20 \times 1 = 20$  Marks)

1. Branch and Bound is mainly used for solving \_\_\_\_\_ problems.
2. The search space in Branch and Bound is represented by a solution space \_\_\_\_\_.
3. The process of dividing a problem into subproblems is called \_\_\_\_\_.
4. The process of eliminating unpromising nodes is called \_\_\_\_\_.
5. In Branch and Bound, a cost estimate is called a \_\_\_\_\_.
6. The Traveling Salesperson Problem is commonly abbreviated as \_\_\_\_\_.
7. In TSP, the salesperson must return to the \_\_\_\_\_ city.
8. The objective of the 0/1 Knapsack Problem is to maximize \_\_\_\_\_.
9. In the 0/1 Knapsack Problem, items cannot be selected \_\_\_\_\_.
10. LC Branch and Bound stands for \_\_\_\_\_ Cost Branch and Bound.
11. FIFO Branch and Bound uses a \_\_\_\_\_ data structure.
12. LC Branch and Bound often uses a \_\_\_\_\_ queue.
13. A node removed from further consideration is said to be \_\_\_\_\_.
14. NP stands for Non-deterministic \_\_\_\_\_ time.
15. A \_\_\_\_\_ algorithm follows exactly one computation path for a given input.
16. NP problems can be verified in \_\_\_\_\_ time.
17. Every NP-Complete problem belongs to the class \_\_\_\_\_.

18. Cook's Theorem established that the \_\_\_\_\_ problem is NP-Complete.
19. NP-Hard problems are at least as \_\_\_\_\_ as NP problems.
20. SAT stands for Boolean \_\_\_\_\_ Problem.

## ANSWERS

### Part-A: MCQs

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

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### Part-B: Fill in the Blanks

1. Optimization
2. Tree
3. Branching
4. Pruning
5. Bound
6. TSP
7. Starting
8. Profit
9. Partially
10. Least



11. Queue
12. Priority
13. Pruned
14. Polynomial
15. Deterministic
16. Polynomial
17. NP
18. SAT
19. Hard
20. Satisfiability

Total Marks: 40