UNIT–1: Algorithm Basics & Analysis (Q1–Q17)

1. An algorithm must always
   A) Be recursive
   B) Terminate after finite steps
   C) Use arrays
   D) Be written in C
   ✅ **Answer: B**
2. Which is NOT a characteristic of an algorithm?
   A) Finiteness
   B) Definiteness
   C) Ambiguity
   D) Effectiveness
   ✅ **Answer: C**
3. Best-case complexity refers to
   A) Maximum time
   B) Minimum time
   C) Average time
   D) Random time
   ✅ **Answer: B**
4. Worst-case complexity gives
   A) Lower bound
   B) Upper bound
   C) Average bound
   D) Exact bound
   ✅ **Answer: B**
5. Big-O notation represents
   A) Lower bound
   B) Tight bound
   C) Upper bound
   D) Average bound
   ✅ **Answer: C**
6. Ω (Omega) notation represents
   A) Upper bound
   B) Lower bound
   C) Tight bound
   D) Average bound
   ✅ **Answer: B**
7. Θ (Theta) notation represents
   A) Upper bound
   B) Lower bound
   C) Exact bound

D) Random bound

✅ **Answer: C**

8. Asymptotic analysis ignores
   A) Input size
   B) Constants
   C) Algorithm logic
   D) Loops
   ✅ **Answer: B**
9. Time–space tradeoff means
   A) More time, more space
   B) Less time, more space
   C) More space, less time
   D) Both B and C
   ✅ **Answer: D**
10. Empirical analysis involves
    A) Mathematical proof
    B) Running programs
    C) Pseudocode
    D) Recurrence relations
    ✅ **Answer: B**
11. Recursive algorithm analysis uses
    A) Loops
    B) Stack
    C) Recurrence relations
    D) Arrays
    ✅ **Answer: C**
12. Substitution method involves
    A) Tree expansion
    B) Guess and prove
    C) Random trials
    D) Tabulation
    ✅ **Answer: B**
13. Recursion tree method visualizes
    A) Stack
    B) Memory
    C) Cost per level
    D) Code flow
    ✅ **Answer: C**
14. Master's theorem applies to
    A) Iterative loops
    B) Sorting algorithms
    C) Divide and conquer recurrences
    D) Dynamic programming
    ✅ **Answer: C**

15. T(n) = T(n/2) + O(1) gives
    A) O(n)
    B) O(log n)
    C) O(n log n)
    D) $O(n^2)$
    ✅ **Answer: B**
16. Performance measurement includes
    A) Only time
    B) Only space
    C) Time and space
    D) Cost
    ✅ **Answer: C**
17. Average-case analysis depends on
    A) Input distribution
    B) Hardware
    C) Compiler
    D) OS
    ✅ **Answer: A**

UNIT–2: Divide & Conquer and Heaps (Q18–Q35)

18. Divide and Conquer has how many steps?
    A) 2
    B) 3
    C) 4
    D) 5
    ✅ **Answer: B**
19. Binary search works on
    A) Unsorted array
    B) Sorted array
    C) Linked list only
    D) Tree only
    ✅ **Answer: B**
20. Time complexity of binary search is
    A) O(n)
    B) O(n log n)
    C) O(log n)
    D) O(1)
    ✅ **Answer: C**
21. Merge sort is
    A) In-place
    B) Unstable

C) Stable
D) Quadratic
✅ **Answer: C**

22. Merge sort time complexity is
A) $O(n^2)$
B) O(n log n)
C) O(log n)
D) O(n)
✅ **Answer: B**

23. Quick sort worst-case complexity is
A) O(n log n)
B) O(log n)
C) $O(n^2)$
D) O(n)
✅ **Answer: C**

24. Quick sort is faster in practice because
A) No recursion
B) In-place
C) Less comparisons
D) Cache friendly
✅ **Answer: B**

25. Linear-time selection algorithm finds
A) Maximum
B) Median
C) k-th smallest
D) Sum
✅ **Answer: C**

26. Median of medians ensures
A) Best case
B) Average case
C) Worst-case linear time
D) Constant time
✅ **Answer: C**

27. Strassen's algorithm improves
A) Space
B) Matrix addition
C) Matrix multiplication
D) Sorting
✅ **Answer: C**

28. Strassen's time complexity is
A) $O(n^3)$
B) $O(n^2)$
C) O(n^2.81)
D) O(n log n)
✅ **Answer: C**

29. Karatsuba algorithm is used for
    A) Division
    B) Sorting
    C) Fast multiplication
    D) Searching
    ✅ **Answer: C**
30. Heap is a
    A) BST
    B) Complete binary tree
    C) Graph
    D) Array
    ✅ **Answer: B**
31. Min heap property ensures
    A) Parent ≥ children
    B) Parent ≤ children
    C) Left < right
    D) Sorted order
    ✅ **Answer: B**
32. Build heap time complexity is
    A) O(n log n)
    B) O(log n)
    C) O(n)
    D) $O(n^2)$
    ✅ **Answer: C**
33. Heap sort time complexity is
    A) $O(n^2)$
    B) O(n log n)
    C) O(log n)
    D) O(n)
    ✅ **Answer: B**
34. Heap sort is
    A) Stable
    B) Unstable
    C) Recursive
    D) Quadratic
    ✅ **Answer: B**
35. Priority queue is efficiently implemented using
    A) Stack
    B) Queue
    C) Heap
    D) Tree
    ✅ **Answer: C**

UNIT–3: Design Techniques & Greedy (Q36–Q52)

36. Brute-force approach tries
    A) Best option
    B) Greedy option
    C) All possibilities
    D) Random option
    ✅ **Answer: C**
37. Greedy algorithm makes
    A) Global optimal choice
    B) Local optimal choice
    C) Random choice
    D) Exhaustive choice
    ✅ **Answer: B**
38. Greedy algorithms always give optimal solution
    A) True
    B) False
    ✅ **Answer: B**
39. Dynamic programming is useful when subproblems
    A) Are independent
    B) Overlap
    C) Are random
    D) Are infinite
    ✅ **Answer: B**
40. Backtracking is used for
    A) Optimization
    B) Enumeration
    C) Feasibility problems
    D) Sorting
    ✅ **Answer: C**
41. Branch and Bound is used for
    A) Feasibility problems
    B) Optimization problems
    C) Sorting
    D) Searching
    ✅ **Answer: B**
42. MST stands for
    A) Minimum Shortest Tree
    B) Minimum Spanning Tree
    C) Maximum Spanning Tree
    D) Minimum Search Tree
    ✅ **Answer: B**
43. Prim’s algorithm is based on
    A) Divide and conquer

B) Dynamic programming
C) Greedy approach
D) Backtracking
✅ **Answer: C**

44. Kruskal's algorithm uses
A) DFS
B) Union-Find
C) BFS
D) Stack
✅ **Answer: B**

45. Fractional knapsack uses
A) DP
B) Greedy
C) Backtracking
D) Branch and Bound
✅ **Answer: B**

46. 0–1 Knapsack uses
A) Greedy
B) DP
C) Brute force
D) Random
✅ **Answer: B**

47. Job sequencing problem maximizes
A) Time
B) Weight
C) Profit
D) Cost
✅ **Answer: C**

48. Huffman coding is used for
A) Encryption
B) Compression
C) Sorting
D) Searching
✅ **Answer: B**

49. Huffman coding generates
A) Fixed length codes
B) Prefix codes
C) Binary trees only
D) Hash codes
✅ **Answer: B**

50. Dijkstra's algorithm finds
A) MST
B) All-pairs shortest path
C) Single-source shortest path

D) Longest path

✅ **Answer: C**

51. Greedy fails when
    A) Optimal substructure absent
    B) Overlapping subproblems exist
    C) Local choice is not global optimal
    D) Input is sorted

    ✅ **Answer: C**
52. Backtracking prunes solutions that are
    A) Optimal
    B) Infeasible
    C) Expensive
    D) Recursive

    ✅ **Answer: B**

UNIT–4: Dynamic Programming & Heuristics (Q53–Q68)

53. DP stores results of
    A) Independent subproblems
    B) Overlapping subproblems
    C) Random problems
    D) Large problems

    ✅ **Answer: B**
54. DP avoids
    A) Recursion
    B) Re-computation
    C) Iteration
    D) Optimization

    ✅ **Answer: B**
55. Fibonacci using DP runs in
    A) $O(2^n)$
    B) $O(n^2)$
    C) O(n)
    D) O(log n)

    ✅ **Answer: C**
56. Matrix Chain Multiplication minimizes
    A) Time
    B) Memory
    C) Scalar multiplications
    D) Matrices

    ✅ **Answer: C**

57. LCS stands for
    A) Longest Common Subsequence
    B) Largest Common String
    C) Least Common Subsequence
    D) Longest Continuous String
    ✅ **Answer: A**
58. LCS is used in
    A) Sorting
    B) Scheduling
    C) Bioinformatics
    D) Encryption
    ✅ **Answer: C**
59. TSP belongs to
    A) P
    B) NP-complete
    C) NP-hard
    D) Linear time
    ✅ **Answer: C**
60. Rod cutting problem aims to
    A) Minimize cost
    B) Maximize profit
    C) Sort rods
    D) Pack rods
    ✅ **Answer: B**
61. Bin packing problem is
    A) Polynomial
    B) NP-hard
    C) Trivial
    D) Constant time
    ✅ **Answer: B**
62. DP vs Divide & Conquer: DP
    A) Recomputes results
    B) Stores results
    C) Uses no recursion
    D) Uses greedy
    ✅ **Answer: B**
63. Heuristics provide
    A) Exact solution
    B) Optimal solution always
    C) Approximate solution
    D) Worst solution
    ✅ **Answer: C**
64. Heuristics are used for
    A) Easy problems
    B) NP-hard problems

C) Linear problems
D) Trivial problems
✅ **Answer: B**

65. Heuristic solutions are
A) Slow
B) Guaranteed optimal
C) Fast
D) Exact
✅ **Answer: C**

66. TSP DP solution complexity is
A) $O(n^2)$
B) $O(n^3)$
C) $O(n \cdot 2^n)$
D) $O(n!)$
✅ **Answer: C**

67. Bin packing greedy approach is
A) First fit
B) Best fit
C) Worst fit
D) All
✅ **Answer: D**

68. DP table size depends on
A) Hardware
B) Input size
C) OS
D) Language
✅ **Answer: B**

UNIT–5: Graph & Tree Algorithms (Q69–Q85)

69. Graph can be represented using
A) Matrix
B) List
C) Both
D) None
✅ **Answer: C**

70. Adjacency matrix space is
A) O(V)
B) O(E)
C) $O(V^2)$
D) O(V+E)
✅ **Answer: C**

71. BFS uses
    A) Stack
    B) Queue
    C) Recursion
    D) Heap
    ✅ **Answer: B**
72. DFS uses
    A) Queue
    B) Heap
    C) Stack
    D) Array
    ✅ **Answer: C**
73. BFS finds
    A) Any path
    B) Shortest path in unweighted graph
    C) Longest path
    D) MST
    ✅ **Answer: B**
74. DFS is used for
    A) Shortest path
    B) Topological sort
    C) MST
    D) Network flow
    ✅ **Answer: B**
75. Bellman-Ford handles
    A) Positive weights only
    B) Negative weights
    C) No weights
    D) Zero weights
    ✅ **Answer: B**
76. Bellman-Ford time complexity is
    A) $O(V^2)$
    B) O(E log V)
    C) O(VE)
    D) $O(V^3)$
    ✅ **Answer: C**
77. Dijkstra fails with
    A) Positive edges
    B) Negative edges
    C) Zero edges
    D) Weighted graphs
    ✅ **Answer: B**
78. Dijkstra using heap runs in
    A) $O(V^2)$
    B) O(E log V)

C) O(VE)
D) $O(V^3)$
✅ **Answer: B**

79. Floyd-Warshall computes
A) Single source shortest path
B) MST
C) All-pairs shortest path
D) DFS
✅ **Answer: C**

80. Floyd-Warshall time complexity is
A) $O(V^2)$
B) O(E log V)
C) $O(V^3)$
D) O(VE)
✅ **Answer: C**

81. Transitive closure finds
A) Path length
B) Reachability
C) MST
D) Degree
✅ **Answer: B**

82. Topological sort is applicable to
A) Cyclic graph
B) DAG
C) Tree
D) Weighted graph
✅ **Answer: B**

83. Network flow algorithm computes
A) Shortest path
B) Maximum flow
C) MST
D) Cycle
✅ **Answer: B**

84. Ford-Fulkerson uses
A) Greedy
B) BFS
C) DFS
D) Residual graph
✅ **Answer: D**

85. Connected components are found using
A) DFS or BFS
B) Dijkstra
C) Floyd
D) Kruskal
✅ **Answer: A**

UNIT–6: Complexity Classes & Advanced Topics (Q86–Q100)

86. Tractable problems are solvable in
    A) Exponential time
    B) Polynomial time
    C) Infinite time
    D) Random time
    ✅ **Answer: B**
87. Intractable problems require
    A) Polynomial time
    B) Constant time
    C) Exponential time
    D) Linear time
    ✅ **Answer: C**
88. Class P problems are
    A) Hard
    B) Easy
    C) Undecidable
    D) Random
    ✅ **Answer: B**
89. Class NP problems are
    A) Solvable in polynomial time
    B) Verifiable in polynomial time
    C) Undecidable
    D) Unsolvable
    ✅ **Answer: B**
90. NP-complete problems are
    A) Easiest
    B) Hardest in NP
    C) Polynomial
    D) Linear
    ✅ **Answer: B**
91. NP-hard problems may not be
    A) Hard
    B) Verifiable
    C) In NP
    D) Polynomial
    ✅ **Answer: C**
92. Cook's theorem states that
    A) P = NP

B) SAT is NP-complete
C) NP is empty
D) TSP is polynomial
✅ **Answer: B**

93. SAT stands for
A) Satisfiability
B) Simple Algorithm Test
C) System Analysis Tool
D) Search Algorithm Test
✅ **Answer: A**

94. Reduction technique is used to
A) Simplify algorithm
B) Prove NP-completeness
C) Optimize code
D) Sort data
✅ **Answer: B**

95. Polynomial-time reduction means
A) Exponential transformation
B) Fast transformation
C) Slow transformation
D) Random transformation
✅ **Answer: B**

96. Approximation algorithms give
A) Exact solution
B) Near-optimal solution
C) Worst solution
D) Random solution
✅ **Answer: B**

97. Performance ratio measures
A) Speed
B) Memory
C) Quality of approximation
D) Randomness
✅ **Answer: C**

98. Randomized algorithms use
A) Deterministic choices
B) Random numbers
C) DP
D) Greedy
✅ **Answer: B**

99. Las Vegas algorithms
A) Give wrong answers
B) Always correct but random time
C) Always fast but wrong

D) Are deterministic

✅ **Answer: B**

100. Monte Carlo algorithms

A) Always correct

B) May give incorrect answer

C) Deterministic

D) Use DP

✅ **Answer: B**

If you want next:

- **Answer-only revision sheet**
- **Unit-wise MCQ test PDFs**
- **Important repeated exam MCQs**
- **Short notes for last-day revision**

Just tell me 👍