

Mock Exam Paper

Your Name

July 25, 2024

Instructions

Answer all the questions. Each question carries equal marks.

Questions

1. What is the time complexity of binary search in a sorted array?
 - (a) $O(1)$
 - (b) $O(\log n)$
 - (c) $O(n)$
 - (d) $O(n \log n)$
2. In a skip list, what is the expected space complexity?
 - (a) $O(n)$
 - (b) $O(n \log n)$
 - (c) $O(n^2)$
 - (d) $O(2^n)$
3. Which data structure follows the Last-In-First-Out (LIFO) principle?
 - (a) Queue
 - (b) Stack
 - (c) Linked List
 - (d) Array
4. What is the time complexity of the enqueue operation in a queue implemented using an array?
 - (a) $O(1)$
 - (b) $O(\log n)$
 - (c) $O(n)$
 - (d) $O(n^2)$

5. In a singly linked list, which operation typically has $O(n)$ time complexity?
- (a) Insertion at the beginning
 - (b) Deletion at the beginning
 - (c) Insertion at the end
 - (d) Accessing the first element
6. What is the main advantage of using a skip list over a linked list?
- (a) Lower space complexity
 - (b) Faster insertion
 - (c) Faster search
 - (d) Simpler implementation
7. Which of the following is NOT a characteristic of a recursive algorithm?
- (a) Base case
 - (b) Recursive case
 - (c) Stack usage
 - (d) Constant time complexity
8. In a binary search tree (BST), where is the largest element located?
- (a) Root node
 - (b) Leftmost leaf
 - (c) Rightmost leaf
 - (d) Any leaf node
9. What is the height of a perfectly balanced binary tree with n nodes?
- (a) $\log n$
 - (b) n
 - (c) $\frac{n}{2}$
 - (d) \sqrt{n}
10. Which rotation is performed in an AVL tree when the balance factor is 2 and the left child's balance factor is -1?
- (a) Left rotation
 - (b) Right rotation
 - (c) Left-Right rotation
 - (d) Right-Left rotation
11. In a Red-Black tree, what color must the root node always be?
- (a) Red

- (b) Black
 - (c) Either Red or Black
 - (d) Alternating
12. What is the minimum degree of a B-tree?
- (a) 1
 - (b) 2
 - (c) 3
 - (d) Depends on the implementation
13. What is the primary use of a trie data structure?
- (a) Sorting
 - (b) String searching
 - (c) Graph traversal
 - (d) Mathematical calculations
14. Which hashing technique uses linked lists to handle collisions?
- (a) Open addressing
 - (b) Double hashing
 - (c) Chaining
 - (d) Cuckoo hashing
15. In the Union-Find data structure, what does the Find operation do?
- (a) Creates a new set
 - (b) Merges two sets
 - (c) Finds the representative of a set
 - (d) Splits a set
16. Which sorting algorithm is in-place and stable?
- (a) Quick Sort
 - (b) Merge Sort
 - (c) Heap Sort
 - (d) Bubble Sort
17. What is the worst-case time complexity of Quicksort?
- (a) $O(n)$
 - (b) $O(n \log n)$
 - (c) $O(n^2)$
 - (d) $O(2^n)$

18. In graph theory, what does BFS stand for?
- (a) Best First Search
 - (b) Breadth First Search
 - (c) Binary First Search
 - (d) Back First Search
19. Which graph traversal algorithm uses a stack?
- (a) BFS
 - (b) DFS
 - (c) Dijkstra's
 - (d) Prim's
20. What is the time complexity of Kruskal's algorithm for finding a minimum spanning tree?
- (a) $O(E)$
 - (b) $O(V)$
 - (c) $O(E \log E)$
 - (d) $O(V^2)$
21. Which algorithm is used to find the shortest path in a weighted graph with negative edge weights?
- (a) Dijkstra's
 - (b) Bellman-Ford
 - (c) A*
 - (d) Floyd-Warshall
22. What is the main characteristic of a greedy algorithm?
- (a) Always finds the global optimum
 - (b) Uses dynamic programming
 - (c) Makes locally optimal choices
 - (d) Has exponential time complexity
23. In the context of dynamic programming, what does "overlapping subproblems" mean?
- (a) The problem can't be solved
 - (b) The same subproblems are solved multiple times
 - (c) The problem has no optimal substructure
 - (d) The problem requires recursion
24. What is the time complexity of the rod cutting problem solved using dynamic programming?

- (a) $O(n)$
 - (b) $O(n^2)$
 - (c) $O(2^n)$
 - (d) $O(n!)$
25. In the 0/1 Knapsack problem, what does the '0/1' signify?
- (a) The weights must be 0 or 1
 - (b) The values must be 0 or 1
 - (c) Items can't be divided
 - (d) The knapsack capacity must be 0 or 1
26. What is the time complexity of finding the maximum subarray sum using Kadane's algorithm?
- (a) $O(n)$
 - (b) $O(n \log n)$
 - (c) $O(n^2)$
 - (d) $O(2^n)$
27. In the context of approximation algorithms, what does α represent in an α -approximation algorithm for a minimization problem?
- (a) The optimal solution
 - (b) The approximate solution
 - (c) The ratio between the approximate and optimal solutions
 - (d) The error margin
28. Which of the following is NOT a backtracking algorithm?
- (a) N-Queens
 - (b) Sudoku Solver
 - (c) Prim's Algorithm
 - (d) Hamiltonian Path
29. What is the main difference between backtracking and branch and bound?
- (a) Backtracking uses dynamic programming
 - (b) Branch and bound use a greedy approach
 - (c) Branch and bound uses pruning
 - (d) Backtracking doesn't use pruning
30. In a min-heap, where is the smallest element located?
- (a) Root node
 - (b) Any leaf node

- (c) Leftmost leaf
 - (d) Rightmost leaf
31. Which data structure is used in Dijkstra's algorithm to store and update the distances to the source?
- (a) Stack
 - (b) Queue
 - (c) Priority queue
 - (d) Linked list
32. What is the time complexity of the matrix chain multiplication problem solved using dynamic programming?
- (a) $O(n)$
 - (b) $O(n^2)$
 - (c) $O(n^3)$
 - (d) $O(2^n)$
33. Which of the following problems is NP-complete?
- (a) Linear programming
 - (b) Binary search
 - (c) Sorting
 - (d) Traveling Salesman Problem (TSP)

Answer Key

1. (b)
2. (a)
3. (b)
4. (a)
5. (c)
6. (c)
7. (d)
8. (c)
9. (a)
10. (c)
11. (b)
12. (b)
13. (b)
14. (c)
15. (c)
16. (d)
17. (d)
18. (c)
19. (b)
20. (c)
21. (b)
22. (c)
23. (b)
24. (a)
25. (c)
26. (c)
27. (c)
28. (d)

29. (a)

30. (c)

31. (d)

32. (c)

33. (c)

34. (d)