

Final Exam Format:

Multiple Choices 35-40 questions

- Select only one answer.

Written Questions: 3 Questions (Trees, Sorting and Graphs)

Example Multiple Choice Exam Questions

1. In a binary tree, the node directly above a given node is called:

- a) Parent
- b) Child
- c) Sibling
- d) Descendant
- e) Ancestor

2. If you know the key you are searching for in a binary search tree (BST) is smaller than the root's key, where should you continue your search?

- a) In the left subtree
- b) In the right subtree
- c) In both the left and right subtrees
- d) At the root node
- e) At the leaves of the tree

3. In a binary search tree (BST), what happens during the deletion of a node with two children?

- a) The node is simply removed, and the left child becomes the new parent.
- b) The node is replaced by its in-order successor or predecessor.
- c) The node is replaced by its left child.
- d) The node is replaced by its right child.
- e) The node is removed, and the subtree is rotated.

4. When deleting a node in a binary search tree (BST) with only one child, what happens to the child of the deleted node?

- a) It becomes the new root of the tree.
- b) It is replaced by the sibling of the deleted node.
- c) It is removed, and the subtree is rearranged.
- d) It becomes the child of the parent of the deleted node.
- e) It remains in the same position.

5. What is the worst-case time complexity for searching an element in an unsorted array of size n using sequential search?

- a) $O(n)$
- b) $O(\log n)$
- c) $O(n \log n)$
- d) $O(n^2)$
- e) $O(1)$

6. In hashing, what is the purpose of a hash function?

- a) To determine the size of the hash table
- b) To generate a unique key for each element
- c) To determine the load factor of the hash table
- d) To map keys to indices in the hash table
- e) To handle collisions in the hash table

7. Which type of collision resolution technique involves creating a linked list at each index to handle collisions?

- a) Quadratic probing
- b) Chaining
- c) Linear probing
- d) Double hashing
- e) Cuckoo hashing

8. In which sorting algorithm is the key idea to repeatedly swap adjacent elements if they are in the wrong order?

- a) Insertion sort
- b) Selection sort
- c) Bubble sort
- d) Merge sort
- e) Shell sort

9. In bubble sort, what is the time complexity in the best-case scenario?

- a) $O(n)$
- b) $O(n \log n)$
- c) $O(n^2)$
- d) $O(\log n)$
- e) $O(1)$

10. Which sorting algorithm works by repeatedly dividing the array into halves and merging them?

- a) Bubble sort
- b) Insertion sort
- c) Selection sort
- d) Quick sort
- e) Merge sort

11. In a graph, what do the edges represent?

- a) Connections between nodes
- b) The value of each node
- c) The height of the graph
- d) The width of the graph
- e) The depth of the graph

12. Which algorithm is used for finding the shortest path in a weighted graph?

- a) Breadth-First Search (BFS)
- b) Depth-First Search (DFS)
- c) Dijkstra's Algorithm
- d) Kruskal's Algorithm
- e) Prim's Algorithm

13. What is a weighted graph?

- a) A graph with a large number of nodes
- b) A graph with values associated with each node
- c) A graph where the edges have different lengths or weights
- d) A graph with a directed structure
- e) A graph with cyclic components

14. What is the minimum number of nodes required to form a simple cycle in a graph?

- a) 2 nodes
- b) 3 nodes
- c) 4 nodes
- d) 1 node

15. In a directed graph, what is the difference between a path and a simple path?

- a) There is no difference; the terms are used interchangeably.
- b) A path can have repeated edges, while a simple path cannot.
- c) A path can have repeated nodes, while a simple path cannot.
- d) A simple path can have repeated nodes, while a path cannot.
- e) A path can have loops, while a simple path cannot.

16. You are given a set of coins with different denominations. What greedy algorithm can be applied to find the minimum number of coins needed to make change for a given amount?

- a) Choose the coin with the largest denomination first.
- b) Choose the coin with the smallest denomination first.
- c) Choose the coin that brings the total closest to the target amount.
- d) Choose coins randomly.
- e) Choose the coin with the median denomination first.