(7 pages) **Reg. No. :** .....

Code No. : 7790 **Sub. Code : WCSM 11**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023

First Semester

Computer Science – Core

ANALYSIS AND DESIGN OF ALGORITHMS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following data structures is most efficient for implementing a priority queue?

   (a) Stack (b) Queue

   (c) Heap (d) Array

2. Which type of graph has all its edges directed from one vertex to another?

   (a) Directed graph (b) Undirected graph

   (c) Bipartite graph (d) Weighted graph

3. Which data structure is used to represent a hierarchical structure with parent-child relationships?

   (a) Stack (b) Queue

   (c) Binary Tree (d) Heap

4. What is a common technique used for binary trees to visit all nodes in a specific order?

   (a) Sorting (b) Searching

   (c) Traversal (d) Merging

5. In binary search, what's the time complexity for searching in a sorted array of size n?

   (a) O(1) (b) O(log n)

   (c) O(n) (d) O(n^2)

6. Which search technique in graphs is used to find the shortest path between two nodes in a weighted graph?

   (a) Depth-First Search (DFS)

   (b) Breadth-First Search (BFS)

   (c) Dijkstra's algorithm

   (d) Binary search

7. What is the time complexity of Prim's algorithm for finding a minimum cost spanning tree?

(a) O(n log n) (b) O(n^2)

(c) O(2^n) (d) O(n!)

8. Consider a complete graph G with 4 vertices. The graph G has ———— spanning trees.

(a) 15 (b) 8

(c) 16 (d) 13

9. What is the primary goal of the Knapsack Problem?

(a) To maximize the number of items selected

(b) To minimize the total weight of selected items

(c) To maximize the total value of selected items

(d) To minimize the total value of selected items

10. Which algorithm can efficiently solve the 0/1 Knapsack Problem for small instances?

(a) Dynamic Programming

(b) Greedy Algorithm

(c) Depth-First Search (DFS)

(d) Breadth-First Search (BFS)

11. In a multistage graph, what do the nodes represent?

(a) Stages (b) Edges

(c) Weights (d) Solutions

12. Which of the following problems should be solved using dynamic programming?

(a) Mergesort

(b) Binary search

(c) Longest common subsequence

(d) Quicksort

13. Which of the problems cannot be solved by backtracking method?

(a) n-queen problem

(b) subset sum problem

(c) hamiltonian circuit problem

(d) travelling salesman problem

14. The problem of finding a subset of positive integers whose sum is equal to a given positive integer is called as?

(a) n- queen problem

(b) subset sum problem

(c) knapsack problem

(d) hamiltonian circuit problem

15. For how many queens was the extended version of Eight Queen Puzzle applicable for n*n squares?

(a) 5 (b) 6

(c) 8 (d) n

PART B — (5 × 4 = 20 marks)

Answer ALL questions, either (a) or (b).

16. (a) Interpret the concept of binary tree.

Or

(b) How do you measure the performance of an algorithm? Explain.

17. (a) Explain about BPS in detail.

Or

(b) Differentiate between search and traversal in graph.

18. (a) Construct a minimum spanning tree using Kruskal's algorithm.

Or

(b) Bring out the advantages and disadvantages of greedy method.

19. (a) How to find the minimum cost using multistage graph? Explain.

Or

(b) Elaborate note on flow shop scheduling.

20. (a) Write about Hamiltonian cycle. Give an example.

Or

(b) Explain about general back tracking method.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

21. (a) Define queue. Write an algorithm for insert and delete operations on queue.

Or

(b) Describe the asymptotic notations.

22. (a) How merge procedure perform with merge sort? Explain with suitable example.

Or

(b) Construct the binary search algorithm. Explain with an example.

23. (a) Formulate the greedy based algorithm to generate single source shortest path. Explain with an example.

Or

(b) Solve the knapsack problem using algorithm.

24. (a) How solution will be provided for all pair shortest path problem using dynamic programming? Discuss.

Or

(b) Explain optimal binary tree with an example.

25. (a) Describe the traveling salesperson problem using branch and bound.

Or

(b) Demonstrate the sum of subsets problem with example.