Seat No: _____                    Enrollment No: _____
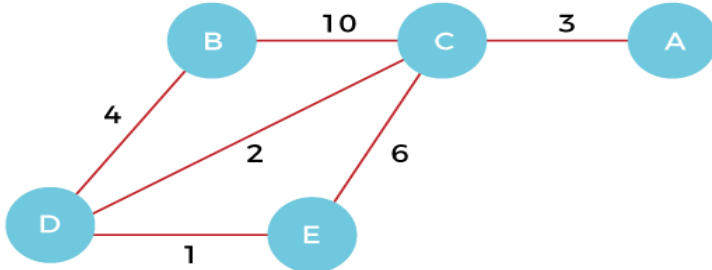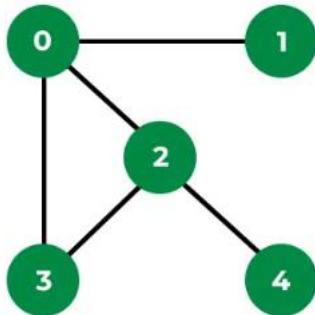
## PARUL UNIVERSITY
### FACULTY OF ENGINEERING & TECHNOLOGY
**BTech Regular Exam, Semester - 5, Winter 2023-24**

**Semester: 5**                                                    **Date: 21-11-23**
**Subject Code: (203105318)**                          **Time: 02:00 pm to 04:30 pm**
**Subject Name: (Design and Analysis of Algorithm)**       **Total Marks: 60**

**Instructions:**
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

| Q.1 | **Objective Type Questions** - (All are compulsory)  (Each of one mark) | **(15)** | CO | PO | B.T |
|---|---|---|---|---|---|
| | 1. Which of the following time complexities represents the fastest algorithm?<br>a) O(1)<br>b) O(log n)<br>c) O(n)<br>d) O(n^2) | | | | |
| | 2. Which algorithmic paradigm focuses on breaking a problem into smaller subproblems and solving each subproblem only once?<br>a) Divide and Conquer<br>b) Greedy<br>c) Dynamic Programming<br>d) Brute Force | | | | |
| | 3. The Master Theorem is used for analyzing the time complexity of algorithms that follow which paradigm?<br>a) Divide and Conquer<br>b) Greedy<br>c) Dynamic Programming<br>d) Backtracking | | | | |
| | 4. Which sorting algorithm has an average and worst-case time complexity of O(n^2) but can be optimized to O(n*log n)?<br>a) Bubble Sort<br>b) Insertion Sort<br>c) Quick Sort<br>d) Merge Sort | | | | |
| | 5. In a graph data structure, what does a vertex represent?<br>a) A directed edge<br>b) A node or point<br>c) A weighted connection<br>d) A traversal path | | | | |
| | 6. Which algorithm is commonly used for finding the shortest path in a weighted, directed graph?<br>a) Depth-First Search (DFS)<br>b) Breadth-First Search (BFS)<br>c) Dijkstra's Algorithm<br>d) Kruskal's Algorithm | | | | |
| | 7. Which algorithm is commonly used for searching in a sorted array with a time complexity of O(log n)?<br>a) Linear Search<br>b) Binary Search<br>c) Hashing<br>d) Quick Sort | | | | |
| | 8. Define Time Complexity. | | | | |
| | 9. Define The principle of optimality. | | | | |
| | 10. NP stands for "_____ problems," | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | 11. The P versus NP problem is one of the most famous unsolved problems in computer science and asks whether every problem in P is also in NP or, equivalently, whether P equals "_____." | | | | |
| | 12. Unlike the Greedy technique, Dynamic Programming typically solves problems by considering all possible choices and finding the "_____" solution among them. | | | | |
| | 13. Define Cyclic Graphs. | | | | |
| | 14.Define Backtracking. | | | | |
| | 15. Can you apply the Greedy algorithm paradigm to solve a sorting problem? Yes or No. | | | | |
| Q.2 | **Answer the following questions**. (Attempt any three) | **(15)** | | | |
| | A) Explain Big Oh Notation & Big Omega Notation with proper example. | | | | |
| | B) Consider the following graph to find the Minimum Spanning Tree (MST) using Prime's algorithm.  | | | | |
| | C) Write a difference between NP Hard & NP complete. | | | | |
| | D) Write a difference between Greedy method and Dynamic programming. | | | | |
| Q.3 | A) Consider the following graph and solve it using DFS traversal.  | **(07)** | | | |
| | B) Construct Huffman tree for following elements. | **(08)** | | | |

| Characters | a | e | i | o | u | s | t |
|---|---|---|---|---|---|---|---|
| Frequencies | 10 | 15 | 12 | 3 | 4 | 13 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | **OR** | | | | |
| | B) Write an algorithm for Merge Sort. | **(08)** | | | |
| Q.4 | A) Consider an instance of a problem with coins 1, 4 and 6 units. Illustrate its solutions using dynamic programming approach involving a payment of 8 units or less. | **(07)** | | | |
| | **OR** | | | | |
| | A)  Finding LCS using dynamic programming. Consider two strings. X = BDCB, Y = BACDB | **(07)** | | | |
| | B) Explain N-Queens Problem by using proper example. | **(08)** | | | |