Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

BTech Winter Exam, Winter 2023-24

Semester: 05 **Date: 23-10-2023**
Subject Code: I03105301 **Time: 2:00 pm to 4:30 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 a new question on a new page.

Q.1 **Objective Type Questions** - (All are compulsory) (Each of one mark) **(15)**

1. Which data structure is suitable for implementing a LIFO (Last In, First Out) mechanism? **1**
   a) Queue
   b) Stack
   c) Tree
   d) Hash table
2. In the context of algorithm analysis, what does "space complexity" refer to? **1**
   a) The amount of physical memory required by the algorithm.
   b) The time taken by the algorithm to execute on different input sizes.
   c) The number of arithmetic operations performed by the algorithm.
   d) The maximum depth of the recursion stack.
3. In the context of algorithm analysis, what does the term "asymptotic" refer to? **1**
   a) The best-case scenario.
   b) The worst-case scenario.
   c) The behavior of an algorithm as the input size grows to infinity.
   d) The expected outcome.
4. What is the primary goal of divide and conquer algorithms? **1**
   a) To break a problem into smaller subproblems.
   b) To choose the simplest algorithm available.
   c) To use brute force to solve problems.
   d) To analyze problems using recursion.
5. In the context of algorithm design, what is the purpose of pseudocode? **1**
   a) To create machine-level code.
   b) To create a step-by-step plan for an algorithm.
   c) To generate random numbers.
   d) To document the history of algorithms.
6. Define the term "NP-completeness" in the context of computational problems. **1**
7. What is the primary purpose of using "Big O" notation in algorithm analysis? **1**
8. Differentiate between "greedy" and "dynamic programming" algorithm design strategies. **1**
9. Explain the key difference between "heapsort" and "mergesort" algorithms. **1**
10. What is the primary goal of analyzing the time complexity of an algorithm? **1**
11. Which algorithm design technique is used to solve optimization problems? **1**
12. What does Dijkstra's algorithm aim to solve? **1**
13. Which data structure is suitable for implementing a FIFO (First In First Out) mechanism? **1**
14. What is the purpose of Big O notation in algorithm analysis? **1**
15. What is the time complexity of the mergesort algorithm? **1**

Q.2 Answer the following questions. (Attempt any three)

A) Explain the process of binary search with an example. **5**

B) Given an array of integers, explain how the merge sort algorithm works and provide its time complexity. **5**

C) Find Optimal Merge Pattern of given files. **(07)**

Files -[A,B,C,D,E]

Size- [5, 3, 2, 7, 9, 13]

D)Solve the following recurrence relation using the Master Theorem: $T(n) = 2T(n/2) + n$. **5**

Q.3 A) Explain in brief Breadth First Search and Depth First Search Traversal techniques of a Graph with Example. **5**

B) Show each step to sort the array using the insertion Algorithm **(08)**

array ={5,3,9,7,4,2,8,6}

OR

B) Explain why analysis of algorithms is important? Explain: Worst Case, Best Case and Average Case Complexity with suitable example. **(08)**

Q.4 A) Explain in brief Huffman Coding with Example ? **(07)**

OR

A) Find longest common substring in X and Y **(07)**

X: ABCBDAB

Y: BDCABA

B) Compare Dynamic Programming Technique with Greedy Algorithms. Write the characteristics of Greedy Algorithms. **(08)**