Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S3 (S,FE) (FT/WP) / S1 (PT) Examination November/December 2025 (2019 Scheme)

# Course Code: CST201

## Course Name: DATA STRUCTURES

Max. Marks: 100 Duration: 3 Hours

### PART A

***Answer all questions. Each question carries 3 marks*** Marks

1 Explain the following terms (3)
   a) Data Type
   b) Data Structure
   c) Abstract Data Type

2 Write a recursive algorithm to find the factorial of a number and calculate its frequency count (3)

3 How the Bivariate polynomial $15x^5y^7 - 22x^4y^6 + 9x^3y^5 + 14x^2y^4 + 32xy^3 + 19$ can be represented using an array (3)

4 How is a Circular Queue different from a normal Queue (3)

5 Write an algorithm to delete the last element of a singly linked list. (3)

6 Write a procedure to add a node after a specified node in a doubly linked list. (3)

7 With examples explain the difference between a Complete Binary Tree and a Full Binary Tree (3)

8 Explain the following terms (3)
   a) Connected Graph
   b) Complete Graph

9 Show the step by step sorting using Insertion sort of the following set of numbers 49, 18, 87, 21, 85, 42, 54, 63, 12 (3)

10 Find the index location of the following values using Fold Shifting (3)
   a) 1522756
   b) 5499025
   c) 11943936

### PART B

***Answer any one full question from each module. Each question carries 14 marks***

#### Module 1

11 a) Discuss how a System is developed (10)
   b) What is the difference between recursive algorithms and iterative algorithms (4)

12 a) Write an algorithm to find the transpose of a matrix and find its frequency count (10)
   b) How can we compare two algorithms which does the same task (4)

#### Module 2

| | | | |
|---|---|---|---|
| 13 | a) | Write a procedure to add two matrices represented in tuple form | (10) |
| | b) | Compare a Stack with a Queue | (4) |
| 14 | a) | Write a procedure to add two polynomials stored using arrays | (7) |
| | b) | Write a procedure to convert an infix expression to a postfix expression | (7) |

**Module 3**

| | | | |
|---|---|---|---|
| 15 | a) | Write an algorithm to split to combine two circular linked lists to form a single circular list | (10) |
| | b) | What is a Self Referential Structure ? How can we declare a Self Referential Structure | (4) |
| 16 | a) | Write a procedure to subtract one polynomial from another polynomial represented using Linked List | (9) |
| | b) | Write an algorithm for Best-fit allocation | (5) |

**Module 4**

| | | | |
|---|---|---|---|
| 17 | a) | Write recursive algorithms for inorder, preorder and postorder traversal of Binary Tree | (9) |
| | b) | How Binary Trees can be represented in memory | (5) |
| 18 | a) | Write the algorithm for Breadth First search Graph traversal. Illustrate the traversing with the help of an example. | (10) |
| | b) | Is Binary Tree a Graph. Justify your answer | (4) |

**Module 5**

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|---|---|---|---|
| 19 | a) | Write a recursive algorithm for Quick Sort and explain it with an example | (10) |
| | b) | What is a Max-heap explain with a diagram | (4) |
| 20 | a) | Consider a hash table of size 7 and hash function h(k)= k mod 7. Draw the table that results after inserting in the given order, the following values.19, 26, 13, 48,17 for each of the three scenarios.<br>i) When collisions are handled by separate chaining. (3)<br>ii) When collisions are handled by linear probing. (3)<br>iii) When collisions are handled by double hashing using second hash function h(k)= k mod 5. (4) | (10) |
| | b) | How Midsquare method can be used for Hashing | (4) |

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