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0800CST201122006



Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S3 (S,FE) (FT/WP) (S1 PT) Examination May 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 Define Big O notation. (3)
- 2 Compute the time complexity of the following code using frequency count method. `for(i=1;i<=n;i++)`  
`{ for(j=1;j<=i;j++)` (3)  
`k=k+1; }`
- 3 What is a sparse matrix. How a sparse matrix can be represented using arrays. (3)
- 4 Evaluate the following post fix expression. `abc*+d-`, where `a=5,b=4,c=3,d=7` (3)
- 5 Write any two applications of list data structure. (3)
- 6 What are self-referential structures? Give an example for declaring it (3)
- 7 Write an algorithm for the pre order traversal in a binary tree. (3)
- 8 With examples explain complete graph and connected graph (3)
- 9 Derive the worst case and best case running time of insertion sort. (3)
- 10 Explain any two hash functions with examples. (3)

**PART B**

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

**Module 1**

- 11 a) Explain the various phases in the system life cycle. (8)  
b) Write an algorithm to find the largest element in an array and compute the time complexity. (6)
- 12 a) What is meant by space complexity and time complexity of an algorithm? How is it measured? (10)  
b) Write notes on the characteristics of an algorithm. (4)

**Module 2**

- 13 a) Write algorithms to implement a circular Queue using arrays. (6)  
b) Write an algorithm to convert an infix expression to its equivalent postfix expression. Why an infix expression is converted to postfix expression? (8)

- 14 a) Discuss the different ways of implementing priority queues? (6)  
 b) Write an algorithm to implement the addition of two polynomials represented using arrays (8)

### Module 3

- 15 a) Write an algorithm to count the number of nodes in a singly linked list. (7)  
 b) Implement a stack using singly linked list. (7)  
 16 a) Write an algorithm to insert an item in a sorted circular singly linked list. (7)  
 b) What are the commonly used memory allocation schemes explain with examples. Discuss on internal and external fragmentation (7)

### Module 4

- 17 a) Insert the following elements to an empty binary search tree. (5)  
 23, 34, 11, 9, 24, 15, 36, 8, 17, 26, 33  
 b) Illustrate with an example the breadth first search in a graph. Write an algorithm for the same. (9)  
 18 a) What is a binary search tree. Write an algorithm to search for an element in a binary search tree. (7)  
 b) Draw the binary tree corresponding to the array representation. (4)

A	B	C	-	D	-	E	-	-	F
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- c) Write any two applications of graph data structure. (3)

### Module 5

- 19 a) With an example illustrate quick sort method and write an algorithm to sort N numbers using quick sort. (10)  
 b) Show the steps involved in sorting following numbers using merge sort. (4)  
 21, 3, 12, 15, 8, 34, 5, 27, 9, 18, 11  
 20 a) Given a hash table of size 13 with starting index 0. Insert the following numbers to the hash table using the hash function  $h_1(x) = x \bmod 13$  and resolve collision using double hashing with  $h_2(x) = 8 - (x \bmod 7)$  (8)  
 19, 18, 48, 21, 54, 33, 47, 43, 38, 45  
 b) What are the characteristics of a good hash function? (3)  
 c) What is meant by primary clustering. (3)

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