

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019**

**Course Code: CS205**

**Course Name: DATA STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- |   |   |     |       |
|---|---|-----|-------|
| 1 | Calculate the run-time efficiency of the following program segment using frequency count analysis.<br><code>for (i = 1; i &lt;= n; i++)<br/>for (j = 1; j &lt;= n; j++)<br/>printf ("%d %d \n", i, j);</code> | (3) | Marks |
| 2 | Let $F(n) = n^2 + n$ . Can you say $F(n)$ is $O(n^3)$ ? Justify your answer.  | (3) |       |
| 3 | Why a doubly linked list is known as two way list? Draw a doubly linked list with data values 25, 45, 15.   | (3) |       |
| 4 | Let <b>LIST</b> be a singly linked list in memory. Write an algorithm to find the number of times a given data item <b>X</b> occurs in <b>LIST</b> .  | (3) |       |

**PART B**

*Answer any two full questions, each carries 9 marks.*

- |   |  |       |       |
|---|--|-------|-------|
| 5 | a) Write an algorithm/pseudo code to find the sum of two square matrices and find the time complexity of the algorithm using frequency count method. | (6)   | Marks |
|   | b) Compare recursive and iterative algorithms.   | (3)   |       |
| 6 | a) Explain stepwise refinement technique with the help of an example.  | (4.5) | Marks |
|   | b) Write an algorithm/pseudo code to add a new element in a particular position of an array.   | (4.5) |       |
| 7 | a) Represent the polynomial $4x^3y+5xy^2+8$ using a singly linked list.  | (1)   | Marks |
|   | b) Write an algorithm/pseudo code to perform addition of two single variable polynomials using singly linked lists.                                  | (8)   |       |

**PART C**

*Answer all questions, each carries 3 marks.*

- |    |  |     |       |
|----|--|-----|-------|
| 8  | Perform the following operations in the given order on an empty stack of size 5. Display the stack after each operation. Mention TOP of the stack.<br><code>POP(), PUSH(5), PUSH(8), POP(), PUSH(4), PUSH(2), POP()</code> | (3) | Marks |
| 9  | What is a Binary tree? Give an example. Give its array representation.   | (3) |       |
| 10 | How is a circular queue represented using an array. Write down the QUEUE FULL condition for a circular queue.  | (3) |       |
| 11 | What is a complete binary tree and full binary tree? Give example for each.  | (3) |       |

**PART D**

*Answer any two full questions, each carries 9 marks.*

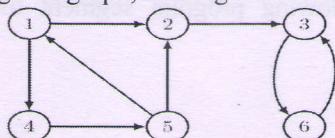
- |    |  |     |       |
|----|--|-----|-------|
| 12 | a) Trace the infix to postfix algorithm (clearly showing the status of stack) to find the equivalent postfix expression for the following infix expression.<br>$A + (B * C - (D / E ^ F) * G)$ | (5) | Marks |
|    | b) Write a non recursive (iterative) algorithm/pseudo code to perform preorder traversal of a binary tree .  | (4) |       |
| 13 | a) Write an algorithm/pseudo code to insert an element in a circular queue using array.  | (3) |       |

- b) Create a Binary Search tree (BST) using the following data entered sequentially. (6)  
 10, 5, 14, 7, 12, 18, 15, 13  
 i). Perform in order traversal of the created BST.  
 ii) Delete 7, 18 and 10 from the created BST.
- 14 a) Write an algorithm/pseudo code for postfix evaluation using stack. (5)  
 b) Write an algorithm/pseudo code to search for a given element in a binary search tree. (4)

### PART E

*Answer any four full questions, each carries 10 marks.*

- 15 a) How a graph is represented using adjacency matrix? Give example. (4)  
 b) Explain BFS with the help of an algorithm/pseudo code. Perform BFS on the given graph, starting from node 5. (6)



- 16 a) Design an iterative binary search algorithm. (5)  
 b) An array contains the elements shown below. Using the Binary search algorithm, trace the steps followed to find 88. After each iteration, show the contents of variables used. What is the number of comparisons required?  
 13, 17, 18, 26, 44, 56, 88, 97, 100 (5)
- 17 a) Write an algorithm/pseudo code for performing linear search in an array of n elements and find the time complexity for the best, worst and average case. (5)  
 b) Write down the algorithm/pseudo code for insertion sort. (5)
- 18 a) Write an algorithm/ pseudo code for performing merge sort on an array of n elements. (5)  
 b) Where is a hash table data structure used? Explain any two commonly used hash functions with examples. (5)
- 19 a) Define a max heap. Construct a max heap with the following set of numbers entered sequentially. (5)  
 10, 5, 14, 7, 12, 18, 15, 13  
 b) Let the size of a hash table be 7. The index of the hash table varies from 0 to 6. Consider the keys 89, 18, 49, 58, 25 in the order. Show how the keys are stored in the hash table (use linear probing). (5)
- 20 a) Write an algorithm/ pseudo code for performing Quick sort on an array of n elements. (5)  
 b) Let the size of the hash table be 10. The index of the hash table varies from 0 to 9. Consider the keys 43, 24, 57, 12, 10, 64, 19, 82, 36, 39 in the order. Show how the keys are occupied. Use chaining method. (5)

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