

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

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

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

**Course Code: CS205**

**Course Name: DATA STRUCTURES (CS,IT)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | Define Big Oh, Big Omega and Big Theta Notations.  | (3)   |
| 2 | Compare structured approach and object oriented approach of programming.                   | (3)   |
| 3 | Represent the following matrix using row major order and column major order.               | (3)   |
|   | $\begin{matrix} 10 & 20 & -32 & 44 \\ 3 & 99 & 12 & -20 \\ 21 & -4 & 33 & 89 \end{matrix}$ |       |
| 4 | Write an algorithm to count the number of nodes in a singly linked list.                   | (3)   |

**PART B**

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

- |   |  |     |
|---|--|-----|
| 5 | a) Define recursive function. What are the essential conditions to be satisfied by a recursive function?       | (4) |
|   | b) Write a recursive function to find the factorial of a given number. Write its time complexity.              | (5) |
| 6 | Write algorithms to perform the following operations on a doubly linked list.                                  |     |
|   | (i) Insert a node with data 'y' after a node whose data is 'x'.  | (3) |
|   | (ii) Delete a node whose data is 's'.  | (3) |
|   | (iii) Insert a node with data 'a' as the 1 <sup>st</sup> node of the list.                                     | (3) |
| 7 | a) Explain structured approach to problem solving.   | (3) |
|   | b) Write an algorithm to add 2 polynomials (single variable polynomials) represented using singly linked list. | (6) |

**PART C**

*Answer all questions, each carries 3 marks.*

- |    |   |     |
|----|---|-----|
| 8  | Write an algorithm to reverse a string using stack.   | (3) |
| 9  | What are the disadvantages of representing a linear queue using array? How are they overcome? | (3) |
| 10 | Define (i) Tree (ii) Binary Tree  | (3) |

- 11 Draw the binary tree whose sequential representation is given below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	C	D	-	E	F	-	G	-	-	H	-	-	I

**PART D**

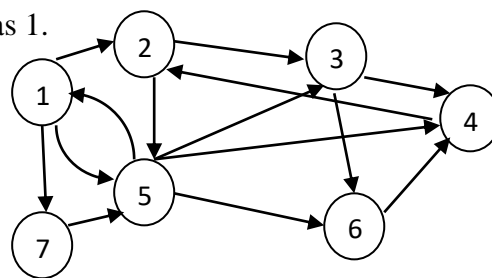
*Answer any two full questions, each carries 9 marks.*

- 12 a) What is a binary search tree (BST)? Give an example of a BST with five nodes. (3)
- b) Assume that a stack is represented using linked list. Write algorithms for the following operations:-
- (i) Push
- (ii) Pop (6)
- 13 Write an algorithm to evaluate postfix expression. Trace the algorithm on the following input
- 623+-84/+23^+ (all numbers are single digits) (9)
- 14 a) Write an algorithm to search for a substring in a given string. (4)
- b) Write an iterative algorithm to perform in order traversal of a binary tree. (5)

**PART E**

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

- 15 a) Explain the various ways in which a graph can be represented bringing out the advantages and disadvantages of each representation. (6)
- b) Write an algorithm to perform bubble sort on a collection of 'n' numbers. (4)
- 16 a) Write algorithms for DFS and BFS traversal on a graph. (6)
- b) Write the output of DFS and BFS traversals on the following graph considering starting vertex as 1. (4)



- 17 a) Write an algorithm for Quick sort. (5)
- b) Trace the working of the algorithm on the following input (5)
- 38, 8, 0, 28, 45, -13, 89, 66, 42
- 18 a) Compare Binary Search and Linear Search. (3)
- b) Write an algorithm to perform binary search on a given set of 'n' numbers. (7)
- Using the algorithm search for the element 23 in the set [12, 23, 34, 44, 48, 53,

87, 99]

- 19 a) What is meant by collision? Give an example. (2)
- b) Explain the four different hashing functions with an example for each. (8)
- 20 Given the values {2341, 4234, 2839, 430, 22, 397, 3920} a hash table of size 7 and a hash function  $h(x) = x \bmod 7$ , show the resulting table after inserting the values in the given order with each of the following collision strategies.
- (i) separate chaining
- (ii) linear probing
- (iii) double hashing with second hash function  $h_1(x) = (2x - 1) \bmod 7$ . (10)

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