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)

                 10   20   -32   44
                 3   99   12   -20
                 21   -4   33   89

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 1st 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

(3)

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)
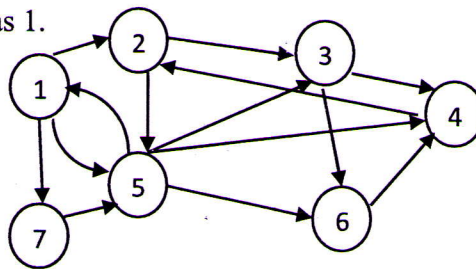
17 a) Write an algorithm for Quick sort. (5)

    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.

      Using the algorithm search for the element 23 in the set [12, 23, 34, 44, 48, 53, (7)

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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