D 08000CS205122301 Pages: 3

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S, FE) / S3 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: CS205

Course Name: DATA STRUCTURES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 Define Big O notation. Prove that $n^3 + n + 5 = O(n^3)$ (3)

2 Write any three criteria satisfied by an algorithm. (3)

3 Write an iterative algorithm to count total number of nodes in a given singly linked list. (3)

4 Represent the polynomial $4x^3 + 6x^2 + 10x + 6$ using a linked list. (3)

PART B

Answer any two full questions, each carries 9 marks.

5 a) Explain stepwise refinement technique. (4.5)

b) Draw the structure of a node in a doubly linked list. Write an algorithm to delete the last node of doubly linked list with an example. (4.5)

6 a) Describe an algorithm for finding an element x in a list of distinct elements $a_1, a_2, .., a_n$. (4.5)

b) What is circular linked list? Write an algorithm to insert a node at the beginning of a circular linked list. (4.5)

7 a) Compare recursive and iterative algorithms (4.5)

b) Write an algorithm to add two single variable polynomials represented by linked list. (4.5)

PART C

Answer all questions, each carries 3 marks.

8 Convert the infix expression (A + B) / (C – D) – (E * F) into postfix expression. (3)

9 Explain first fit allocation, best fit allocation and worst fit allocation schemes. (3)

10 Define a complete binary tree. Give one example. (3)

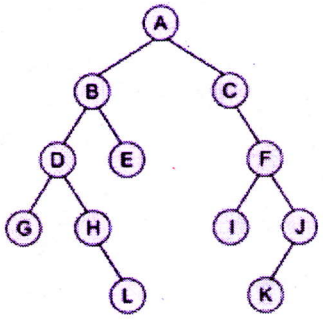
11 Give the non-recursive algorithm for in-order traversal of a binary tree using a stack. (3)

PART D

Answer any two full questions, each carries 9 marks.

12 a) Write algorithm for push and pop operations for a stack using array. (4.5)

b) Find the in-order, pre-order and post-order traversal of the following binary tree (4.5)



13 a) Assume a queue is implemented using linked list. Write algorithm for the following operations: (4.5)

(i) Insert an item into the queue

(ii) Delete an item from the queue

b) Create a binary search tree using the following data elements: 45, 39, 56, 12, 34, 78, 32, 10, 89, 54, 67, and 81 (4.5)

14 a) What is a DEQUEUE? Write an algorithm to insert an element into an output restricted DEQUEUE. (4.5)

b) Write a recursive algorithm to insert a node into binary search tree. (4.5)

PART E

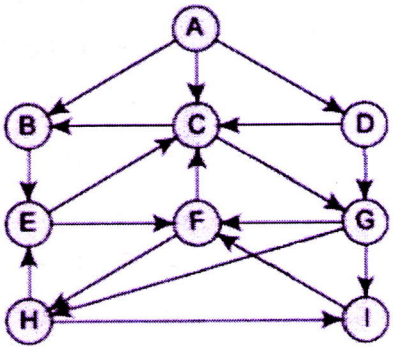
Answer any four full questions, each carries 10 marks.

15 a) Explain the different ways in which a graph can be represented. Give one example for each. (6)

b) Write an algorithm to perform selection sort. Perform selection sort on an array [6,3,1,8,9] (4)

16 a) Write an algorithm to perform DFS on a graph. (4)

b) Perform DFS on the following graph. Start with node H. (6)



17	a)	Define the following terms with examples: (i) Min Heap (ii) Max Heap.	(2)
	b)	An array of 6 elements: 15, 19, 10, 7, 17, and 16 is given. Sort it in ascending order using heap sort.	(8)
18	a)	Write the algorithm for binary search. What is its time complexity?	(4)
	b)	Illustrate the following hashing functions with examples: (i) Division Method. (ii) Mid Square Method. (iii) Folding Method. (iv) Digit Analysis Method.	(6)
19	a)	Mention any three disadvantages of hash data structure.	(3)
	b)	How separate chaining prevents collision? Illustrate with an example.	(7)
20	a)	Discuss the different methods used for open addressing.	(3)
	b)	Using the hash function 'key mod 7', insert the following sequence of keys in the hash table. 50, 700, 76, 85, 92, 73 and 101 Use linear probing technique for collision resolution.	(7)

******