No of Pages : 3 Course Code: 20MX13

Roll No:
(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, MARCH 2022

MCA Semester: 1

20MX13 DATA STRUCTURES

Time : 3 Hours **Maximum Marks: 100**

INSTRUCTIONS:

1. Answer **ALL** questions. Each question carries 20 Marks.
2. Subdivision (a) carries 5 marks each, subdivision (b) carries 8 marks each and subdivision (c) carries 12 marks each.
3. Course Outcome :

Table	Qn.1	CO1.	Qn.2	CO2.	Qn.3	CO3.	Qn.4	CO4.

1. a. What is a ADT? What is its need? Define ADT Queue

   b. Formulate Binary search Algorithm. What is the best case and worst case complexity? Trace the algorithm with the following input : [25, 42, 49, 55, 67, 89, 100, 120] Search key 75.

   c. i. Explain various ways of representing two dimensional arrays in memory. Give suitable example. (4)

   ii. Write the addressing function of the following types of matrices a) lower triangular matrix and b) Symmetric Toeplitz matrix (8)

   Toeplitz matrix is a matrix where the elements on the same diagonal are same.

   Example of symmetric Toeplitz matrix:

   ```
   1 2 3 4 5
   2 1 2 3 4
   3 2 1 2 3
   4 3 2 1 2
   5 4 3 2 1
   ```

   Write the corresponding addressing function.

2. a. Suggest a method for representing two stacks in an array. Write algorithms for the primitive operations for such implementation of stacks.

   b. i. Write algorithms for insert and delete operations on Circular Queue. (4)

   ii. What is a priority queue? What is a dequeue? (4)

   c. Write algorithm for the following. Indicate the data structures used in each case.

   i. Parenthesis Checking ii. Check whether given string is of the syntax wcw^r, where w is a string with alphabets a and b and w^r is the reverse of the string w.

   Example : w = abb and w^r = bba

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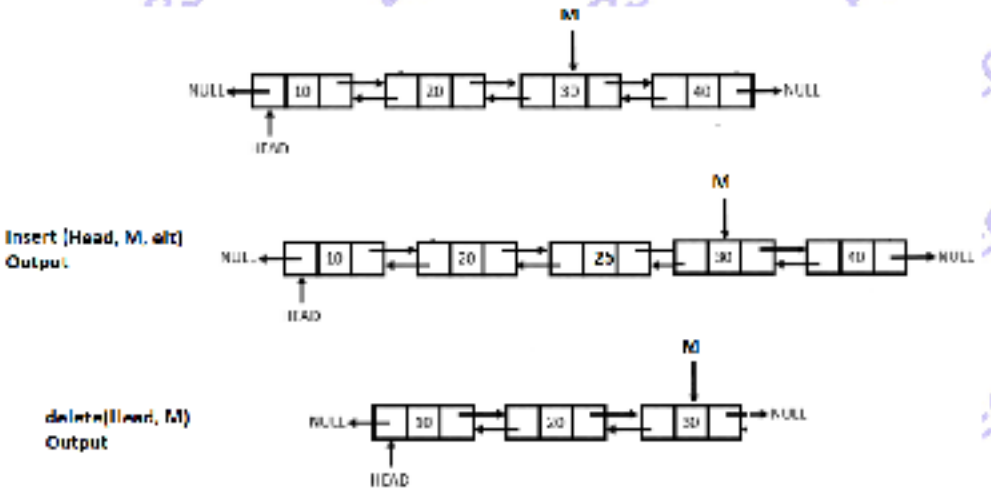
3. a. Compare static and dynamic memory allocation. Explain with a suitable example.

   b. Suggest how a polynomial can be represented using linked list. Write an algorithm to add two polynomials represented using linked list.

   c. i. Compare doubly linked list and singly linked list. Write an algorithm to i. insert an element to the left of the node pointed by M and ii. Delete the node right of the node pointed by M in a doubly linked list.

Sample input and Output



(OR)

ii. What is a circular linked list? Write algorithm of constant complexity O(1) for the following operations on circular linked list:

Insert an element at the beginning of the circular linked list

Insert an element at the end of the circular linked list

4. a. What are the ways of representing a Graph in memory? Illustrate with the graph shown in Fig 1. Indicate which representation of the graph is preferred for the following applications:

   i. Check whether a vertex A is adjacent to vertex B

   ii. List all vertices adjacent to vertex A

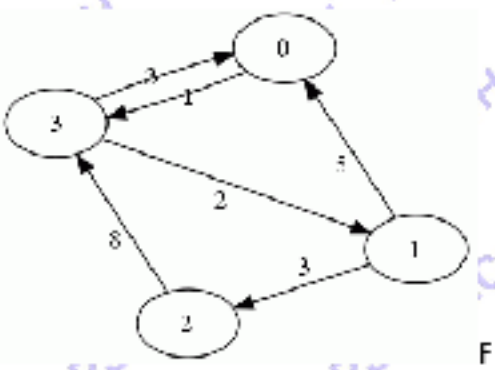


Fig1

b. The inorder traversal of a Binary tree is A B C D E F and its preorder traversal is C A B F D E. Draw the Binary tree and write the postorder sequence. Give the Sequential Representation and Linked List Representation of the tree. Write the sequence in which the nodes are traversed in inorder, preorder and postorder.

c. i. Write algorithms for Breadth First Search and Depth first Search. Trace the algorithms with the graph shown in Fig 2

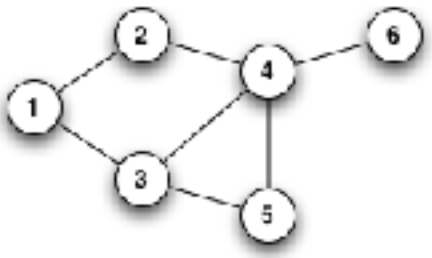


Fig2

(OR)

ii. What is hashing? Explain with example. What is a collision in hashing? Describe the methods used to resolve collisions. In a given hash table with an associated array of size 11, integer keys of 9, 26, 50, 15, 2, 21, 36, 22, and 31, are inserted in that order. For each of the methods, draw the internal structure of the hash table after these insertions have been made.

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FD/RL