4503

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Roll No:

(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, APRIL 2023

MCA Semester: 1

20MX13 DATA STRUCTURES

Time : 3 Hours Maximum Marks : 100
INSTRUCTIONS:

Answer ALL questions. Each question carries 25 Marks.

- a) What are the characteristic properties of an algorithm? Write an algorithm to find Ka without using multiplication, where K and a are integers. What is the complexity of the algorithm?
 - b) Write algorithms for i) Linear and ii) Binary Search. Trace the algorithm on a sample input. Indicate the best and worst case complexity of the algorithms.
 (8)
 - c) Explain various ways of representing two dimensional arrays in memory. Give example for each. Suggest efficient representations of the following types of matrices and write the corresponding addressing functions i) lower triangular matrix and ii) Toeplitz matrix. Toeplitz matrix is a matrix where the elements on the diagonal are same.
- a) What is a dequeue? What are the types of dequeue? Write algorithms for the primitive operations on any one type of dequeuer
 - b) What is a circular Queue? Highlight the difference between linear and circular queue.
 Write algorithms for the primitive operations on circular queue.
 - c) i) 1) Suggest a method for representing two stacks in an array. Write algorithms for the primitive operations on those stacks.
 - Write an algorithm to check the well- formedness of parentheses in an expression using stack. Trace the algorithm on the inputs
 - 1) (a/((b+c)*c-d)/e) 2) (a+b)*(e-b

(OR)

- ii) Write the following algorithms:
 - 1) to convert an infix expression to postfix form
 - to evaluate the postfix expression.

Show the correctness of the algorithm with an example. (12)

a) Compare static and dynamic memory allocation. Explain with suitable example. (5)

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 b) Write an algorithm i) to merge two singly linked list and ii) to delete a node pointed by M in a doubly linked list.

- c) How can polynomials be represented using linked lists? Represent the polynomial x⁵ + 6x³ - 7x +45 using linked list. Write an algorithm to add two polynomials represented using linked lists. What is the complexity of the algorithm? (12)
- a) Explain how binary trees are represented in memory? Show the representation of a complete and a skew tree using these methods.
 - 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. Write the sequence in which the nodes are traversed in inorder, preorder and postorder. (8)
 - i) Write algorithms for BFS and DFS. Trace the algorithms on the graph shown in Fig.1

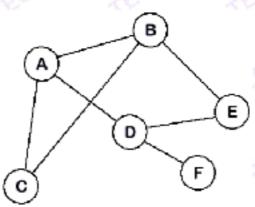


Fig. 1

- ii) What is Hashing? What is the advantage and limitation of using Hashing in searching? What is collision? Explain methods of resolving collisions.
 - Consider a hash table of size 7 with hash function h(k)=k mod 7. Draw the table that results after inserting the following values in the given order: 19, 26, 13, 48, 17. Resolve collisions using each of the collision resolving techniques discussed.

(12)

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FD/JU