USN | | | | | | | | | | | **21CS32**

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Data Structures and Applications

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   What is data structure? Explain in detail classification of data structures with example.
                                                                        (10 Marks)
    b.   Write an algorithm for inserting and deleting an element at a given location in an array and implement the same in 'C' language.   **(10 Marks)**

OR

2   a.   Explain the nested structures with an example of a 'C' program.   **(07 Marks)**
    b.   What are self-referential structures?   **(03 Marks)**
    c.   Explain 'C' library functions for memory allocation/deallocation functions with example.
                                                                        (10 Marks)

Module-2

3   a.   What is stack? Explain basic operations of stack with algorithm.   **(05 Marks)**
    b.   Write 'C' program to implement stack using array.   **(05 Marks)**
    c.   Write an algorithm to convert an infix notation to post fix notation to post fix notation and apply the algorithm for the following infix expression to convert it into post fix.
         $A - (B/C + (D\%E * F)/G) * H$.   **(10 Marks)**

OR

4   a.   What is queue? Explain basic operations of queue with algorithm.   **(06 Marks)**
    b.   Write 'C' program to implement linear queue using array.   **(07 Marks)**
    c.   Explain different types of queues with example.   **(07 Marks)**

Module-3

5   a.   What are linked lists? Explain with algorithm inserting a new node in a linked list for the following cases:
         Case 1 : The new node is inserted at the beginning.
         Case 2 : The new node after a given node.   **(10 Marks)**
    b.   What are circular linked lists? Explain with algorithm deleting a node from a circular linked list for the following cases:
         Case 1 : The first node
         Case 2 : The last node.   **(10 Marks)**

OR

6   a.   Represent polynomial using linked list and explain addition of two polynomial with algorithm.   **(10 Marks)**
    b.   Write a 'C' program to implement stack using linked list.   **(10 Marks)**

Module-4

7 a. What are binary trees? Explain the linked representation of binary tree. (08 Marks)

b. What is binary search tree? Construct the binary tree for the following expression:
$exp = ((a+b)-(c*d))\%((e \wedge f)/(g-h))$. (07 Marks)

c. Write applications of trees. (05 Marks)

OR

8 a. Explain pre-order and in-order traversal with example and also write algorithm. (10 Marks)

b. Explain inserting and deleting a new node in a binary search tree with algorithm. (10 Marks)

Module-5

9 a. What are AVL trees? Explain operations on AVL trees with example. (10 Marks)

b. What are red-black trees? Explain operations on red-black trees with example. (10 Marks)

OR

10 a. Explain the graph representation using adjacency matrix. (05 Marks)

b. Explain the two standard graph traversal algorithms in detail with example. (10 Marks)

c. Explain different hash functions with example. (05 Marks)

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