**Hall Ticket Number: 20CB/CM/CS/DS/IT302**

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| **II/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION** | |
| **January, 2024** | **Common to CB, CM, CS, DS & IT** |
| **Third Semester** | **Data Structures** |
| **Time:** Three Hours | **Maximum:** 70 Marks |
| ***Answer question 1 compulsory.*** | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | **(4X14=56 Marks)** |

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|  |  |  | CO | BL | M |
| 1 | a) | What is an Abstract Data Type (ADT)? | CO1 | L2 | 1M |
|  | b) | How is a Linked List different from an Array? | CO1 | L2 | 1M |
|  | c) | What is the worst case time complexity of inserting a node in a doubly linked list? | CO1 | L2 | 1M |
|  | d) | What is an Underflow condition is in stack and queue data structure? | CO2 | L2 | 1M |
|  | e) | If the elements “A”, “B”, “C” and “D” are placed in a queue and are deleted one at  a time, in what order will they be removed? | CO2 | L2 | 1M |
|  | f) | For the given array with the elements 23, 1, 10, 5, 2. What will be the state of array  after the second pass of insertion sort in ascending order? | CO2 | L2 | 1M |
|  | g) | Define balancing factor. | CO3 | L2 | 1M |
|  | h) | Define AVL Tree? | CO3 | L2 | 1M |
|  | i) | What are internal nodes in a Binary tree? | CO3 | L2 | 1M |
|  | j) | What is a binary heap? | CO4 | L2 | 1M |
|  | k) | What is the time complexity for heap sort? | CO4 | L2 | 1M |
|  | l) | What is separate chaining in a hash table? | CO4 | L2 | 1M |
|  | m) | What would be the Prefix notation for the given equation? A+(B\*C) | CO2 | L2 | 1M |
|  | n) | What is the time complexity of evaluation of postfix expression. | CO2 | L2 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Define asymptotic notation. Explain about different types of asymptotic notations with an example. | CO1 | L2 | 7M |
|  | b) | Given two sorted singly linked lists of integers, List A and List B. Your task is to merge the two lists into a single sorted linked list in non-decreasing order. Propose an algorithm  to accomplish this task and analyze its time complexity. | CO1 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Write a pseudo code for double linked list operations  (i) Insert (ii) Delete (iii) Search. | CO1 | L2 | 9M |
|  | b) | Propose an algorithm to reverse a linked list and analyze its time complexity. | CO1 | L3 | 5M |
| **Unit-II** | | | | | |
| 4 | a) | Depict the trace of selection sort performed on an unordered list given below : 42 23 74 11 65 58 94 36 99 87 | CO2 | L3 | 7M |
|  | b) | In the context of a Queue, what is the difference between enqueue and dequeue operations,  and how do they maintain the order of elements in the Queue? | CO2 | L2 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Write a pseudo code for conversion from infix to postfix. | CO2 | L3 | 7M |
|  | b) | What is the time complexity of the Bubble Sort algorithm, and why is it considered an  inefficient sorting algorithm for large input sizes? | CO2 | L2 | 7M |
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| **Unit-III** | | | | | |
| 6 | a) | What are the properties of Binary Search Tree (BST) and AVL Tree? | CO3 | L2 | 7M |
|  | b) | Construct an AVL tree by inserting the following elements  75 1 38 28 61 68 5 42 55 29  After each insertion make sure the tree is balanced. | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Construct a binary search tree for the keys given below and traverse it in inorder, preorder and postorder.  5 42 55 29 75 1 38 28 61 68 | CO3 | L3 | 7M |
|  | b) | How can an binary expression tree be evaluated to obtain the result of an arithmetic expression? | CO3 | L2 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Depict the insertion of keys 10,22,31,4,15,28,17,88,59 into a hash table of length m=11  using separate chaining with a hash function of your choice. | CO4 | L3 | 7M |
|  | b) | Explain about closed hashing techniques with an example. | CO4 | L2 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Explain (i) Build heap (ii) Insert (iii) Decreased Key operations. | CO4 | L2 | 7M |
|  | b) | Consider the following array of 10 elements: [8, 5, 2, 9, 3, 1, 6, 4]. Explain step-by-  step on how the Heap Sort algorithm can be applied to sort this array in ascending order. | CO4 | L3 | 7M |

