**20CB/CS/DS/IT 302**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **March, 2022** | **Common to CB/CS/DS & IT** | | |
| **Third Semester** | **Data Structures** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |

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| 1. | a) | | What is an algorithm? | CO1 |  |
|  | b) | | What is the necessity of linked lists? | CO1 |  |
|  | c) | | What is ‘Best Case’ and ‘Worst Case’ time complexity analysis? | CO1 |  |
|  | d) | | Differentiate Single and Double Linked Lists. | CO2 |  |
|  | e) | | What are the applications of Queue? | CO2 |  |
|  | f) | | What are the applications of Stacks? | CO2 |  |
|  | g) | | Demonstrate postfix expression evaluation for 456\*+ using Stack. | CO2 |  |
|  | h) | | Define height of the tree. | CO3 |  |
|  | i) | | When a tree is said to be a complete binary tree. | CO3 |  |
|  | j) | | What is the time complexity for heap sort? | CO4 |  |
|  | k) | | Define balancing factor. | CO3 |  |
|  | l) | | What is the time complexity for AVL trees in best case? | CO3 |  |
|  | m) | | What is hash table? | CO4 |  |
|  | n) | | Define Min-Heap. | CO4 |  |
| **Unit - I** | | | | | |
| 2. | a) | Explain time and space complexity of an algorithm with an example. | | CO1 | 7M |
|  | b) | Explain the insertion and deletion operations in a single linked list with source code and suitable node diagrams. | | CO1 | 7M |
| **(OR)** | | | | | |
| 3. | a) | Develop an algorithm to count the number of nodes in a Singly Linked List and discuss the applications of Linked list. | | CO1 | 7M |
|  | b) | Explain in detail about asymptotic notations with suitable examples. | | CO1 | 7M |
| **Unit - II** | | | | | |
| 4. | a) | Write a C routine for Bubble and Selection sort with suitable example. | | CO2 | 7M |
|  | b) | Write algorithms for insertion and deletion operations in a queue implemented using linked list. | | CO2 | 7M |
| **(OR)** | | | | | |
| 5. | a) | What is a Stack? How to represent a stack using array? Give suitable example. | | CO2 | 5M |
|  | b) | Write an ADT to convert Infix expression to Postfix expression. Convert the following Infix to Post expression.  (a+b)\*(c\*d/e^f)-(g+h). | | CO2 | 9M |
| **Unit - III** | | | | | |
| 6. | a) | Explain the following terminology related to Trees:  i) Root node ii) Leaf node iii) Siblings iv) Degree of node  v) Expression tree with an example. | | CO3 | 7M |
|  | b) | Construct a Binary Search Tree for the following list of elements:  Insert the following elements in sequential order  13, 3, 4, 12, 14, 10, 5, 1, 8, 2, 7, 9, 11, 6, 18  From the constructed tree delete the following elements:  4, 10, 2, 7, 13 | | CO3 | 7M |
| **(OR)** | | | | | |
| 7. | a) | Construct AVL Tree for the following elements inserted sequentially into an empty tree.  50, 70, 60, 20, 90, 10, 40, 100 | | CO3 | 7M |
|  | b) | Construct the Binary tree for the following tree traversals:  Inorder: 4,10,12,15,18,22,24,25,31,35,44,50,66,70,90  Preorder: 25,15,10,4,12,22,18,24,50,35,31,44,70,66,90. Find out Postorder for the constructed Binary tree. | | CO3 | 7M |
| **Unit - IV** | | | | | |
| 8. | a) | What is collision and how does it occur. Explain how this is handled in linear open addressing | | CO4 | 7M |
|  | b) | Construct max heap for the following elements:  40, 80, 30, 20, 10, 1, 9, 26, 44 | | CO4 | 7M |
| **(OR)** | | | | | |
| 9. | a) | Explain the concept of separate chaining with suitable example. | | CO4 | 7M |
|  | b) | What are Priority Queues? Explain about heap operations. | | CO4 | 7M |

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