**(3 Hours)** **Total Marks: 80**

**N.B:** **(1) Question No. 1 is compulsory.**
**(2) Attempt any three questions out of the remaining five questions.**
**(3) Figures to the right indicate full marks.**
**(4) Make suitable assumptions wherever necessary.**

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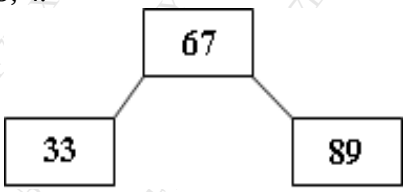
|---|---|---|---|
| Q.1 | (a) | Differentiate between linear and non-linear data structures. | [05] |
| | (b) | Evaluate postfix expression "78+45-*" using stack. Show stack contents at each step. | [05] |
| | (c) | Explain the various ways to represent graph in the memory with example. | [05] |
| | (d) | Write a C function to insert and delete an item in linear queue as linked list. | [05] |
| Q.2 | (a) | Construct Huffman tree for the letters in the string "structures" and find the Huffman codes for each symbol in the string. | [10] |
| | (b) | Write C program for infix to postfix conversion. | [10] |
| Q.3 | (a) | Write a C program to perform following operations on a doubly linked list: i) insert a node from the end of the list, ii) delete first node, iii) display the list. | [10] |
| | (b) | Write a C functions to insert and delete elements with respect to binary search tree. | [10] |
| Q.4 | (a) | Construct an AVL tree by inserting the following elements in the given order: 74, 23, 120, 65, 11, 31, 42, 55, 98, 7. | [10] |
| | (b) | Explain the double ended queue. Explain its types. | [05] |
| | (c) | Define topological sorting. Explain the same with suitable example. | [05] |
| Q.5 | (a) | Given the values {91, 82, 43, 37, 69, 24, 61}, a hash table of size 7 and a hash function h(k) = k mod 7, show the resulting table after inserting the values in the given order with Linear probing. | [10] |
| | (b) | Write an algorithm to check the well-formedness of parenthesis in an algebraic expression using the Stack data structure. | [10] |
| Q.6 | (a) | Insert the given elements in the following B-tree of order-3: 75, 59, 86, 64, 53, 40, 29, 4. | [10] |




Show the B tree at each step of insertion.

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|---|---|---|---|
| | (b) | Write a function in C for BFS traversal of graph. Explain DFS graph traversal with suitable example. | [10] |

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