Duration: 3 hrs   **Total Marks: 80**

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

1   (a)   Define Data Structure. Differentiate linear and non-linear data structures with example.   **(5)**
        (b)   Write a C function to implement Insertion sort.   **(5)**
        (c)   What are different ways to represent graphs in memory?   **(5)**
        (d)   What is expression tree? Derive an expression tree for $(a+(b*c))/((d-e)*f)$ **(5)**

2   (a)   What is Hashing? Hash the following data in a table of size 10 using linear probing and   **(10)**
              quadratic probing. Also find the number of collisions.
                        63, 82, 94, 77, 53, 87, 23, 55, 10,44

        (b)   Write a recursive function to perform pre-order traversal of a binary tree   **(8)**
        (c)   Given an array int a[] = {23,55,63,89,45,67,85,99}. Calculate address of a[5] if base   **(2)**
              address is 5100.

3   (a)   Write a C program to convert infix expression to postfix expression.   **(10)**
        (b)   Demonstrate step by step insertion of the following elements in an AVL tree.   **(10)**
                        63, 9, 19,18,108,99,81,45

4   (a)   Write a C program to implement circular linked list that performs following functions   **(12)**
              -Insert a node in the beginning
              -Insert a node in the end
              -Count the number of nodes
              -Display the list
        (b)   Given the frequency for the following symbols, compute the Huffman code for each   **(8)**
              symbol.

Symbol	A	B	C	D	E	F
Frequency	9	12	5	45	16	13

5   (a)   Explain Double Ended Queue. Write a C program to implement Double Ended Queue   **(12)**
        (b)   Given the postorder and inorder traversal of a binary tree, construct the original tree: **(8)**
                    Postorder: D E F B G L J K H C A
                    Inorder: D B F E A G C L J H K

6   Explain following with suitable example (any two)   **(20)**
          I.   B-tree and splay tree
          II.   Polynomial representation and addition using linked list
          III. Topological Sorting

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