

Data Structures Lab

List of Experiments

1. a) Write a C program to Print 1 to 'n' numbers without using any loops.
- b) Write a C program to reverse the digits of a number using recursive function.
- c) Write a C program to solve the Towers of Hanoi problem using recursive function.
2. a) Design & Develop a C program to perform linear search for a key value in a given list.
- b) Design & Develop a C program to perform Binary search for a key value in a given list.
3. Given a File of N employee records with a set K of Keys(6-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table(HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers.

Design and develop a Program in C that uses Hash function H: KL as $H(K)=K \bmod m$ (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

4. a) Design, Develop and Implement a C program that implement Selection Sort to sort a given list of integers.
- b) Design, Develop and Implement a C program that implement Bubble Sort to sort a given list of integers.
5. a) Design, Develop and Implement C program that implement Quick Sort to sort a given list of integers.
- b) Design, Develop and Implement C program that implement Heap Sort to sort a given list of integers.
- a. Create Polynomials using Last Insertion of nodes, in a decreasing order of exponents.
Example: Polynomial P: $-6 * 7x^3 + 3x^2 + 9x + 6$ deg has 4 nodes. 7,3 3,29,16,0 → Null
- b. Perform Addition of 2 polynomials. (coeff.s of 2 nodes are added only if exp.s match)
Example: Let Polynomials P: $-7x^3 + 3x^2 + 9x + 6$ & Q: $5x^4 + 4x^2 + 6x$. Then $P+Q = 5x^4 + 7x^3 + 7x^2 + 15x + 6$.
- c. Perform Subtraction of 2 polynomials.
- d. Display the Polynomial (nodes) in it.
- e. Exit

7. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)

- a. Push an Element onto Stack.
- b. Pop an Element from Stack.
- c. Demonstrate how Stack can be used to check Palindrome.
- d. Display the status (No. of elements, Empty/Full/not) of Stack.
- e. Exit

Support the program with appropriate functions for each of the above operations

8. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.

9. Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Characters (Array Implementation of Queue with maximum size MAX)

- a. Insert an Element into QUEUE
- b. Delete an Element from QUEUE
- c. Display the status (No. of elements, Empty/Full/not) of QUEUE
- d. Exit

Support the program with appropriate functions for each of the above operations

10. a) Design, Develop and Implement a C program to implement Binary tree traversals using iterative functions.

b) Design, Develop and Implement a C program to implement Binary tree traversals using recursive functions.

11. Design, Develop and Implement a menu driven Program in C for the following operations on

Binary Search Tree (BST) of Integers

- a. Create a BST of N Integers: 89, 38, 24, 40, 95, 76, 57, 11, 59, 18
- b. Traverse the BST in In-order, Pre-order and Post-Order
- c. Search the BST for a given element (Key) and report the appropriate message
- e. Exit

12. Design & Develop a Program in C for the following operations on Graph (G) of Cities

- a. Create a Graph of N cities using Adjacency Matrix.

- b. Print all the nodes reachable from a given starting node in a digraph using DFS or BFS method.
- c. Find the shortest paths to all Cities from a given City using Dijkstra's Algorithm.