

UCS-406 (Data Structure)
Lab Assignment-1 (2 weeks)

Implement the following programs in C/C++/Python/Java using functions

- a) Insertion Sort
- b) Bubble Sort
- c) Selection Sort
- d) Linear Search
- e) Binary Search
- f) Shell sort

Q 1. Display the total number of comparisons and swappings made by each searching/sorting function for the given input N.

Q 2. Create a structure/class for a group of 50 students holding data for their Regn no., Name, Branch, CGPA

- a) Call linear search function to display data of student with a particular Regn no..
- b) Call bubble sort function to arrange data of students according to Regn no.
- c) Apply binary search on the above output (part b) to display data of a student with a particular Regn no.
- d) Use and modify Insertion sort logic to arrange data of students in descending order of CGPA.

LAB Assignment-2

Q 3. Write a program to perform following operations on stack.

- a) Create functions for push and pop operations of stack.
- b) Write a function to convert an infix expression to postfix expression. Pass a one dimensional character array P to the function as input (infix exp) and return character array Q (postfix exp). Test your program for following input

$P : (A - (B / C) * D + E) * F \% G$

- c) Write a function for the evaluation of a given postfix expression. For testing pass the postfix expression Q of part b and supply following set of values.

$A = 90, \quad B = 50, \quad C = 2, \quad D = 3, \quad E = 1, \quad F = 2, \quad G = 5$

Q 4. a) Write program using functions to implement Mergesort.

- b) Write two different (recursive and non-recursive) functions to implement quick sort.
- c) Write two different (recursive and non-recursive) functions to solve towers of Hanoi.

Lab Assignment-3

Q 5. Write a program using functions for implementation of circular Queue.

Q 6. Write a program to perform following operations on Link List

a) Insertion

at the beginning

at the end

at the given location

in the sorted list

b) Deletion

of first node

of last node

of given item of node

of given item from sorted list

c) Given a list, split it into two sublists — one for the front half, and one for the back half.

If the number of elements is odd, the extra element should go in the front list. So

FrontBackSplit() on the list {2, 3, 5, 7, 11} should yield the two lists {2, 3, 5} and {7, 11}.

d) Given two one-way-link lists A and B. Sort them independently and then Merge as list C.

e) Two way link list insertion and Deletion

f) Header link list insertion and deletion

Lab Assignment - 4

Q 7. Write program using functions for binary tree traversals Pre-order, In-order and Post-order using both Recursive and Non-recursive approach.

Q 8. Implement following functions for Binary Search Trees

- a) Search a given item (Recursive & Non-Recursive)
- b) Insertion of a new node
- c) Maximum element of the BST
- d) Minimum element of the BST
- e) Successor of the BST
- f) Delete a given node from the BST

Q 9. Implement Heap Sort.

Q 10. Implement Strassen Matrix Multiplication problem using Divide & Conquer approach.

Q 11. Implement following problems using Greedy Approach:

- a) Partial Knapsack
- b) Huffman compression

Lab Assignment - 5

Q12. Write a program to implement concept of hashing. Design a menu based interface to call different functions for collision handling techniques.

Implement the following problems for Graphs

Q13. Write a program to find approachable nodes from a given source of a given graph using queue as an intermediate data structure (BFS).

Q14. Write a program to traverse various nodes of a given graph using stack as an intermediate data structure (DFS).

Q15. Write a program to find shortest path from a given source to all the approachable nodes (Single source shortest path Dijkstra's algorithm).

Q16. Write a program to find shortest path between all the source destination pairs (All pairs shortest path Floyd's algorithm).

Q17. Write a program to arrange all the nodes of a given graph (Topological sort).

Q18. Write a program to find Minimal spanning tree of a graph using Kruskal's algorithm.

Q19. Write a program to find Minimal spanning tree of a graph using Prim's algorithm.