2/4 B.Tech FIRST SEMESTER

IT3L1 **DATA STRUCTURES LAB** **Credits: 2**
(Common to CSE/IT/ECM)
Lecture: -- **Internal assessment: 25 marks**
Lab: - 3 Periods /week **Semester end examination: 50 marks**

Objectives:

- To implement recursive functions.
- To implement stack, queue, linked list, tree and graph data structures.
- To arrange data using different sorting techniques.

Outcomes:

Students will be able to

- Learn elementary data structures such as stacks, queues, linked lists, trees and graphs
- Design and analyze the time and space efficiency of the data structure
- Identity the appropriate data structure for given problem
- Get practical knowledge on the application of data structures
- Understand different data structures to represent real world problems

Exercise 1

a) Write recursive program which computes the n^{th} Fibonacci number, for appropriate values of n.
b) Write recursive program for calculation of Factorial of an integer

Exercise 2

a) Implementation of stack operations using arrays.
b) Implementation of queue operations using arrays.

Exercise 3

a) Railroad cars numbered are as 0,1,2,---,n-1. Each car is brought into the stack and removed at any time. For instance, if n=3, we could move 0, move 1, move 2 and then take the cars out, producing 2,1,0. Implement application for the given problem.
b) Consider a payment counter at which the customer pays for the items purchased. Every time a customer finished paying for their items, he/she leaves the queue from

the front. Every time another customer enters the line to wait, they join the end of the line. Implement the application for this problem.

Exercise 4

Implementation of singly linked list

Exercise 5

Implementation of doubly linked list

Exercice 6

a) Representation of Sparse matrix.
b) Implementation of circular linked list

Exercise 7

Implement Exercise 3 (a) using linked lists.

Exercise 8

Implement Exercise 3(b) using linked lists.

Exercise 9

a) A polynomial has the main fields as coefficient, exponent in linked list it will have one more field called link to point to next term in the polynomial. If there are n terms in the polynomial then n such nodes has to be created.

Exercise 10

Implementation of binary tree creation, insertion, deletion, traversing

Exercise 11

Implementation of Binary Search Tree operations

Exercise 12

Implementation of Graph traversals

Exercise 13

Implementation of minimum spanning tree

Exercise 14

26, 5, 77, 1, 61, 11, 59, 15, 48, 19
a) Arrange above data set using insertion sort
b) Arrange above data set using Quick sort
c) Arrange above data set using Merge sort

Exercise 15

90, 77, 60, 99, 55, 88, 66, 32, 41, 19
a) Arrange above data set using Heap sort
b) Arrange above data set using Radix sort

Reference books:

1. Seymour Lipschutz, *Data Structures*, Schaum's Outlines Series, Tata McGraw-Hill.
2. Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, *Fundamentals of Data Structures in C*, W. H. Freeman and Company.