**Assignment – 11 and 12**

**(14 Nov. to 3 Dec. 2022)**

**Graphs**

Q1. Write a program to store the graph data structure on an adjacency list and perform the following operations:

a. To traverse the graph in depth-first search (DFS) manner

b. To traverse the graph in breadth-first search (BFS) manner

c. To find the minimum spanning tree of the given graph using Kruskal’s algorithm.

Q2. Write a function to input a directed graph. You can use any method for input such as multi-list, or adjacency matrix or vertex and edge list, etc. Perform the following by writing individual functions for the same:

(i) Find the in-degree of a particular node.

(ii) Find the out-degree of a particular node.

(iii) Find the node with the maximum in-degree.

(iv) Find the node with the minimum in-degree.

(v) Find the degree of a given node.

(vi) Find if a graph has a cycle in it.

**Hashing**

Q1. Construct a hash table of size 7 using the hash function H = key mod 7.

i) Insert elements {11, 12, 15, 17, 19, 26, 34, 37, 56, 58} in a hash table using separate chaining.

ii) Describe how you choose the initial hash function for the above?

iii) Modify your program which returns the number of collisions encountered when hashing data[0], data[1], data[2], ...,data[n-1] into a hash table. and compare the number of collisions of the hash function given and the hash function given by you in ii.

iv) Modify this program so that it uses open addressing hash table using linear probe. v) What are the various advantages and disadvantages of the various collision-resolution strategies?