



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING NATIONAL INSTITUTE OF TECHNOLOGY **Algorithm Laboratory (CSLR41)**

Assignment 4

Problem Statement: Implement Prim's and Kruskal's algorithm to find the minimum spanning tree of a weighted graph of n vertices.

Input: A number n .

The program should have options to generate a random graph of n vertices, as well as, take as input a user-defined n vertex graph in the form of an adjacency matrix.

Tasks:

1. For small n , show step-by-step intermediate graphs.
2. Consider both directed and undirected graphs given from user input as well as generated randomly.
3. Compare the performance of these two different algorithms. Which one is faster and why?
 - a. Check for different n in the range of 100 to 10000.
 - b. Analyze the behavior of many different cases and identify the best case and worst case.
 - c. Plot and find the time complexity in terms of asymptotic notion for all the cases (best, worst, and average over many random cases) by varying input size and noting down the time required for finding the minimum spanning tree.
 - d. Find a function $g(n)$ and the associated constants for which the plot is bounded above and by $g(n)$ for each of the algorithms.
4. Which algorithm can create a forest in the intermediate steps? Which algorithm needs sorting as part of it? Write your observations and derive possible conclusions.