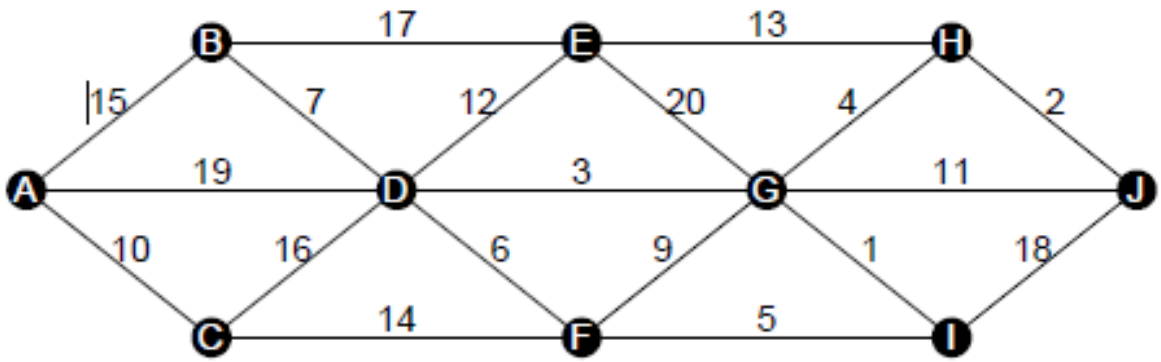
Walchand College of Engineering, Sangli
Computer Science & Engineering
Third Year
Course: Computer Algorithm Lab

Assignment No. 6

Greedy Method

1. Implement Kruskal's algorithm & Prim's algorithm to find **M**inimum **S**panning **T**ree (*MST*) of the given an undirected, connected and weighted graph.



Q) How many edges does a minimum spanning tree for above example?

Q) In a graph *G*. let the edge *u v* have the least weight. is it true that *u v* is always part of any minimum spanning tree of *G*?.Justify your answers.

Q) Let *G* be a graph and T be a minimum spanning tree of *G*. Suppose that the weight of an edge e is decreased. How can you find the minimum spanning tree of the modified graph? What is the runtime of your solution?

Q) Find order of edges for Kruskal's and Prim's?

2. Emergency Evacuation – Container Loading

Evacuating 200 families with varying luggage weights onto a bus with a capacity of **5000 kg**.

Input sample:

Bus Capacity = 5000

Families' luggage = [45, 120, 300, 150, 90, 600, 75, 430, 250, 500,

60, 100, 700, 85, 95, 200, 320, 180, 150, 275, ...]

Implement conainer loading problem.

3. Startup Pitch Scheduling – Job Sequencing

50 startups pitching to an investor, with deadlines (1–10 slots) and profits (10–500).

Input sample:

Startups =

S1(deadline=2, profit=300), S2(1, 200), S3(3, 180), S4(2, 400),

S5(1, 250), S6(3, 100), S7(4, 500), S8(2, 150), S9(3, 220), S10(4, 330), ...

Slots Available = 10

4. Disaster Relief Supply Drop – Fractional Knapsack

Helicopter capacity = **1000 kg**, 100 supply items (divisible & indivisible).

Input sample:

Capacity = 1000

Supplies =

Rice(100, value=500), Medicine(50, value=400, indivisible),

Water(200, value=600), Blankets(150, value=450, indivisible),

Tents(300, value=800, indivisible), Wheat(120, value=300),

Sugar(80, value=250), Oxygen(60, value=700, indivisible),

Milk(90, value=350), FirstAid(40, value=500, indivisible), ...

5. Multi-Server Log Merging – Optimal Merge

A company has **20 log files** with sizes from 5MB to 500MB. Logs arrive in rounds.

Input:

Round 1: [40, 120, 200, 10]

Round 2: [30, 15, 250, 90, 60]

Round 3: [100, 75, 35, 55, 85, 45]

Round 4: [500, 300, 150, 25, 70]

6. Huffman Coding for IoT Sensor Data

IoT network with **20 sensors**, each with frequency (occurrence per hour) and importance factor (1–5).

Input:

Sensors with (Frequency × Importance):

Temp(400), Humidity(300), Pressure(600), Light(150),

Gas(120), Motion(200), Smoke(100), Vibration(250),

Sound(350), CO2(450), pH(80), Toxic(60), Voltage(220),

Current(180), Wind(140), Rain(200), GPS(90), UV(70),

Dust(160), Salinity(110)

Expected Output:

Shortest Codes → Pressure=‘0’, CO2=‘10’, Temp=‘110’, …

Longest Codes → Toxic=‘1111110’, pH=‘1111111’

Average Code Length ≈ 5.3 bits