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Email: teju000kamble@gmail.com

Day 9 and 10 : Assignments

Task 1: Dijkstra's Shortest Path Finder Code Dijkstra's algorithm to find the shortest path from a start nodeto every other node in a weighted graph with positive weights.

Ans: Source Code

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FS_JavaProgramming - Data_strutures/src/com/wipro/graphalgo/MyGraph.java - Eclipse IDE
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                                                                                                                                                                                                        trutures 2 package com.wipro.graphalgo;
 | Datastrutes | 2 | 3 | import java.util.*; | 2 | 3 | import java.util.*; | 3 | import java.util.*; | 5 | public class MyGraph | 5 | comd.sinkedist | 5 | comd.squtems | 7 | import java.util.*; | 5 | public class MyGraph | 6 | private final Map<Integer, List<Node>> adjList; | 5 | public MyGraph(int numOfNodes) | 6 | adjList = new HashMap<| (); | 6 | adjList = new HashMap</ri>
                                       adjList = new HashMap<>();
for (int i = 0; i < numOfNodes; i++) {
     # com.ds.sortingAlgorithr 10
                                                     adjList.put(i, new ArrayList<>())
        public void addEdge(int source, int destination, int weight) {
    adjList.get(source).add(new Node(destination, weight));
    adjList.get(destination).add(new Node(source, weight)); // If the graph is undirected
           > MyGraph.java
> Mode.java
| module-info.java
                                          public List<Node> getAdjNodes(int node) {
    return adjList.get(node);
  B DSA_JavaAssignments
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                                          public int getSize() {
                                                return adjList.size();
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package com. wipro. graphalgo;

2

3 public class Node implements Comparable (Node) {

private final int node.
                              4 private final int node;
5 private final int cost;
6
7 public Node(int node, i
      > # com.ds.graph
> # com.ds.linkedlist
> # com.ds.patterns
                                       public Node(int node, int cost) {
                                               this.node = node;
this.cost = cost;
       # com.ds.queue
        # com.ds.queue 8
com.ds.searching_algori 9
      16⊖
                                         return cost;
}
                                          public int getCost() {
         MyGraph.java
Node.java
                                          public int compareTo(Node other) {
        module-info.java
                                                return Integer.compare(this.cost, other.cost);
                              22
23
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                  □$7|$ :
                                                     1 package com.wipro.graphalgo;
                                                                                                                                                                                                                                                                                                                                  85
     > import java.util.*;
> import java.util.*;

> import java.util.*;

> import java.util.*;

4

5 public class Dijkst
                                                     5 public class Dijkstra {
6  public static void main(String[] args) {
7  int numOfNodes = 5;
         MyGraph graph = new MyGraph(numOfNodes);
                                                                            graph.addEdge(0, 1, 10);
             # com.ds.stack
                                                                           graph.addEdge(0, 2, 3);
graph.addEdge(1, 2, 1);
graph.addEdge(1, 3, 2);
graph.addEdge(2, 3, 8);
graph.addEdge(2, 4, 2);
graph.addEdge(2, 4, 2);
graph.addEdge(3, 4, 7);
                                                    11
          > # com.ds.stack
> # com.ds.timeAndSpaceC
> # com.ds.tree

> # com.wipro.graphalgo
                                                    14
                CycleDetect.java Dijkstra.java
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                                                    16
                FloydsAlgo.java

KrushkalAlgorithm.ja

KruskalsAlgorithm.ja
                                                    18
                                                                            Dijkstra dijkstra = new Dijkstra();
                                                                            int startNode = 0;
int[] shortestPaths = dijkstra.findShortestPaths(graph, startNode);
                Main.java
MyGraph.java
                                                    20
                 21
    22
                                                                            System.out.println("Shortest paths from node " + startNode + ": " + Arrays.toString(shortestPaths));
     ems
                                                    24
                                                    25<sup>©</sup>
26
                                                                    public int[] findShortestPaths(MyGraph graph, int startNode) {
                                                                            int numOfNodes = graph.getSize();
                                                                            int[] distances = new int[numOfNodes];
boolean[] visited = new boolean[numOfNodes];
PriorityQueue(Node> priorityQueue = new PriorityQueue(>();
                                                    27
                                                    28
29
                                                    30
                                                    31
                                                                            Arrays.fill(distances, Integer.MAX_VALUE);
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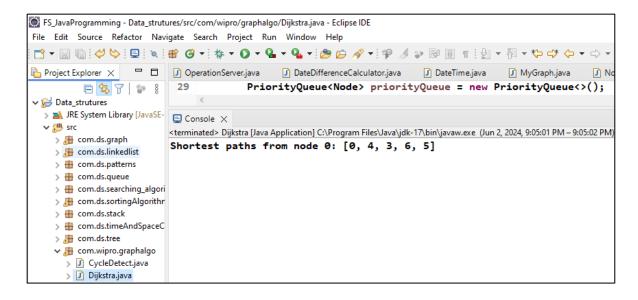
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                                                   30
                                                                           Arrays.fill(distances, Integer.MAX_VALUE);
distances[startNode] = 0;
priorityQueue.add(new Node(startNode, 0));
                                                    33
            com.ds.linkedlist
                                                    34
                                                                            while (!priorityQueue.isEmpty()) {
            # com.ds.queue
                                                                                     Node currentNode = priorityQueue.poll();
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            # com.ds.searching_algori
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                                                                                     int current = currentNode.getNode();
            a com.ds.sortingAlgorithm
            com.ds.stack
com.ds.timeAndSpaceC
                                                                                    if (visited[current]) {
                                                    40
                                                                                               continue;
            a com.ds.tree
                                                                                    }
          ✓ Æ com.wipro.graphalgo
                                                    42

    CycleDetect.java
    Dijkstra.java
    FloydsAlgo.java
    KrushkalAlgorithm.ja

                                                    43
                                                                                    visited[current] = true;
                                                                                    for (Node neighbor: graph.getAdjNodes(current)) {
  int neighborNode = neighbor.getNode();
  int newDist = distances[current] + neighbor.getCost();
                                                    45
                                                   46
                 KruskalsAlgorithm.jav
                                                    47
48
                 Main.java
             > MyGraph.java
> MyGraph.java
> Node.java

Module-info.java
                                                                                             if (newDist < distances[neighborNode]) {
    distances[neighborNode] = newDist;
    priorityQueue.add(new Node(neighborNode, newDist));</pre>
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    BSA_JavaAssignments
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                                                                            return distances;
                                                    58 }
59
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Output:



Task 2: Kruskal's Algorithm for MST Implement Kruskal's algorithm to find the minimum spanning tree of a given connected, undirected graph with non-negative edge weights.

Ans: Source Code

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FS_JavaProgramming - Data_strutures/src/com/wipro/graphalgo/KrushkalAlgorithm.java - Eclipse IDE
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         🖹 😘 🎖 🐌 🔋 1 package com.wipro.graphalgo;
 5 class KruskalAlgorithm
6 {
7° static class Edge
8 {
    > A com.ds.linkedlist
      # com.ds.patterns
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com.ds.sortingAlgorithr
                                       char src, dest;
      ⊕ com.ds.stack
      com.ds.stack 11
com.ds.timeAndSpaceC 12

                                     Edge(char src, char dest, int weight)
{
     > # com.ds.tree

> # com.wipro.graphalgo

> # CycleDetect.java

> # Dijkstra.java
                          15
                                             this.dest = dest:
                                             this.weight = weight;

    FloydsAlgo.java
    KrushkalAlgorithm.ja
    KrushkalAlgorithm.ja
    Main.java

                                 }
                                    private List<Edge> edges;
        MyGraph.java
        Node.java
                           21
                                   private Map<Character, Character> parent;
      module-info.iava
                                   KruskalAlgorithm(List<Edge> edges)
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26
27
                                        this.edges = edges;
this.parent = new HashMap<>();
  mvcstruture
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                           29<sup>6</sup>
30
                                   private char find(char vertex)
                                         if (!parent.containsKev(vertex))
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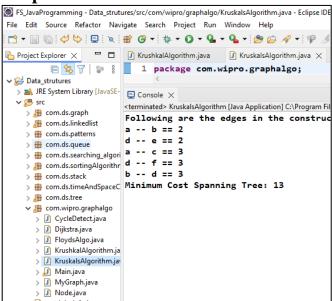
> Mai com.ds.graph
                                                                                                                                                                                                       for (Edge edge : edges) {
                                                                                                                                                                                                                                                                                                                                                             char srcRoot = find(edge.src);
char destRoot = find(edge.dest);
if (srcRoot != destRoot) {
                                  > # comdstand
> # comdstrack
> # comdstreak
> # comdstreak
| # com
                                                                                                                                                                                                                                                                                                                                                                                                mst.add(edge);
                                                                                                                                                                                                                                                                                                                                                                                                union(srcRoot, destRoot);}}
                                                                                                                                                                                                                                                   int minimumCost = 0;
   for (Edge edge : mst) {
        System.out.println(edge.src + " -- " + edge.dest + " == " + edge.weight);
        minimumCost += edge.weight; }
        System.out.println("Minimum Cost Spanning Tree: " + minimumCost); }

public static void main(String[] args){
        List<Edge> edges = new ArrayList<>();
        edges.add(new Edge('a', 'b', 2));
        edges.add(new Edge('a', 'c', 3));
        edges.add(new Edge('a', 'c', 3));
        edges.add(new Edge('a', 'c', 3));
        edges.add(new Edge('b', 'd', 3));
        edges.add(new Edge('b', 'd', 3));
        edges.add(new Edge('c', 'c', 4));
        edges.add(new Edge('c', 'c', 5));
        for edges.add(new Edge('c', 'c', c', c', 5);
        for edges.add
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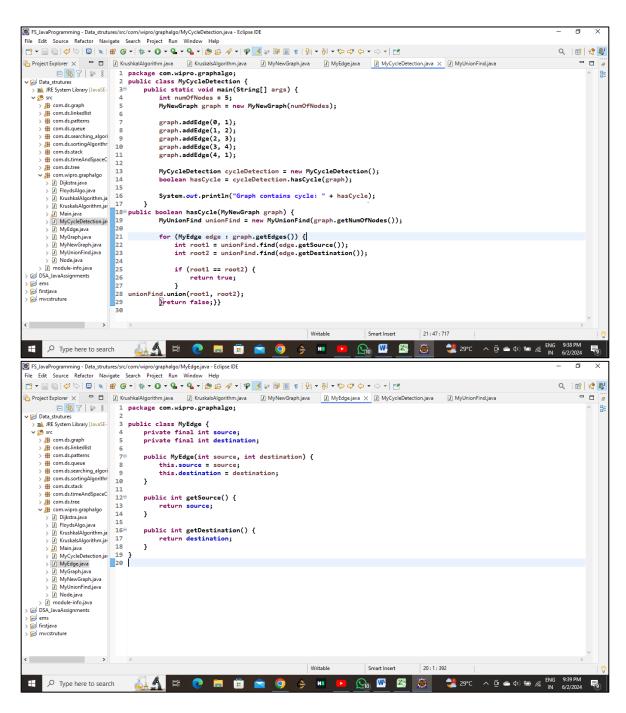
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                mvcstruture
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Output:



Task 3: Union-Find for Cycle Detection Write a Union-Find data structure with path compression. Use this data structure to detect a cycle in an undirected graph.

Ans: Source Code



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🔓 Project Explorer 🗴 🖰 🗖 🚺 Krushkal Algorithm.java 🌓 Kruskals Algorithm.java 🖟 MyNewGraph.java 🗶 MyEdge.java 🖟 MyCycle Detection.java 🖟 MyUnion Find.java
                                                                                                                                                                - - -
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                           1 package com.wipro.graphalgo;
  > import java.util.*;
> import java.util.*;

> import java.util.*;

> import java.util.*;

4

5 public class MyNewG
                           public class MyNewGraph {
    private final int numOfNodes;
    private final List<MyEdge> edges;
    public MyNewGraph(int numOfNodes) {
    this.numOfNodes = numOfNodes;
      # com.ds.stack
    11
                                       this.edges = new ArrayList<>();
                          12
                                  public void addEdge(int source, int destination) {
   edges.add(new MyEdge(source, destination));
}
                          149
       > Dijkstra.java
                        15
      > I FloydsAlgo.java
        FloydsAlgo.java
KrushkalAlgorithm.ja
KruskalsAlgorithm.ja
Main.java
MyCycleDetection.jav
15
16
17
18
19
                          18⊖
                                  public List<MyEdge> getEdges() {
                                  return edges;
     public int getNumOfNodes() {
                                      return numOfNodes;
                                  }
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  mvcstruture
com.wipro.graphalgo.MyNewGraph.java - Data_strutures/src
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                                                                                                                                                                - - -
  | 1 package com.wipro.graphalgo;
| Data_strutures | 2 | public class MyUnionFind {
| ## Strutures | 2 | public class MyUnionFind {
| ## Strutures | 4 | private int[] parent;
| ## comdsgraph | 5 | private int[] rank;
   MyEdge.java
       MyGraph.java
MyNewGraph.java
MyUnionFind.java
                          21
                                       if (root1 != root2) {
                                           (root1 != root2) {
   // Union by rank
if (rank[root1] > rank[root2]) {
    parent[root2] = root1;
} else if (rank[root1] < rank[root2]) {
    parent[root1] = root2;
}</pre>
        Node.java
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      module-info.java
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                                           ems
                                               parent[root2] =
rank[root1]++;
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Output:

