CSE 3004 DAA LAB TASK - 1

NAME : V.SAIKRISHNA
REG. NO :19BCE7638

PRIMS ALGORITHM

Prim's Algorithm is used to find the minimum spanning tree from a graph. Prim's algorithm finds the subset of edges that includes every vertex of the graph such that the sum of the weights of the edges can be minimized. ... The edges with the minimal weights causing no cycles in the graph got selected.

CODE:

```
import java.lang.*;
import java.util.*;
import java.io.*;
class Main {
  private static final
  int countOfVertices = 9;
  int findMinKeyVertex(int keys[], Boolean setOfMST[]) {
```

```
  int minimum_index = -1;
  int minimum_value = Integer.MAX_VALUE;
  for (int vertex = 0; vertex < countOfVertices; vertex++)
  if (setOfMST[vertex] == false && keys[vertex] < minimum_value)
  {
    minimum_value = keys[vertex];
    minimum_index = vertex;

    }
   return minimum_index;
   }
   void showMinimumSpanningTree(int mstArray[], int graphArray[][])
   {
     System.out.println("Edge \t\t Weight");

    for (int j = 1; j < countOfVertices; j++)
     System.out.println(mstArray[j] + " <-> " + j + "\t \t" +
graphArray[j][mstArray[j]]);
    }
  void designMST(int graphArray[][]) {
  int mstArray[] = new int[countOfVertices];
  int keys[] = new int[countOfVertices];
  Boolean setOfMST[] = new Boolean[countOfVertices];
  for (int j = 0; j < countOfVertices; j++)
  {
    keys[j] = Integer.MAX_VALUE; setOfMST[j] = false;
  }
  keys[0] = 0; // it select as first vertex
  mstArray[0] = -1; // set first value of mstArray to -1 to make it root of
MST
  for (int i = 0; i < countOfVertices - 1; i++) {
  int edge = findMinKeyVertex(keys, setOfMST);
  setOfMST[edge] = true;
```

```
  for (int vertex = 0; vertex < countOfVertices; vertex++)

  if (graphArray[edge][vertex] != 0 && setOfMST[vertex] == false &&
graphArray[edge][vertex] < keys[vertex]) {
  mstArray[vertex] = edge;
  keys[vertex] = graphArray[edge][vertex]; }
  }
  showMinimumSpanningTree(mstArray, graphArray); }
  public static void main(String[] args) {
  Main mst = new Main();
  int graphArray[][] = new int[][]{
      { 0, 4, 0, 0, 0, 0, 0, 8, 0 },
   { 4, 0, 8, 0, 0, 0, 0, 11, 0 },
   { 0, 8, 0, 7, 0, 4, 0, 0, 2 },
   { 0, 0, 7, 0, 9, 14, 0, 0, 0 },
   { 0, 0, 0, 9, 0, 10, 0, 0, 0 },
   { 0, 0, 4, 14, 10, 0, 2, 0, 0 },
   { 0, 0, 0, 0, 0, 2, 0, 1, 6 },
   { 8, 11, 0, 0, 0, 0, 1, 0, 7 },
   { 0, 0, 2, 0, 0, 0, 6, 7, 0 }};
  mst.designMST(graphArray);
   }
 }
```

SCREENSHOTS:

```
import java.lang.*;
import java.util.*;
import java.io.*;
class Main {
  private static final
  int countOfVertices = 9;
  int findMinKeyVertex(int keys[], Boolean setOfMST[]) {
  int minimum_index = -1;
  int minimum_value = Integer.MAX_VALUE;
  for (int vertex = 0; vertex < countOfVertices; vertex++)
  if (setOfMST[vertex] == false && keys[vertex] < minimum_value)
  {
    minimum_value = keys[vertex];
    minimum_index = vertex;

    }
   return minimum_index;
   }
   void showMinimumSpanningTree(int mstArray[], int graphArray[][])
   {
     System.out.println("Edge \t\t Weight");

    for (int j = 1; j < countOfVertices; j++)
     System.out.println(mstArray[j] + " <-> " + j + "\t \t" + graphArray[j][mstArray[j]]);
    }
  void designMST(int graphArray[][]) {
  int mstArray[] = new int[countOfVertices];
  int keys[] = new int[countOfVertices];
  Boolean setOfMST[] = new Boolean[countOfVertices];
  for (int j = 0; j < countOfVertices; j++)
  {
    keys[j] = Integer.MAX_VALUE; setOfMST[j] = false;
  }
  keys[0] = 0; // it select as first vertex
```

```
    }
  void designMST(int graphArray[][]) {
  int mstArray[] = new int[countOfVertices];
  int keys[] = new int[countOfVertices];
  Boolean setOfMST[] = new Boolean[countOfVertices];
  for (int j = 0; j < countOfVertices; j++)
  {
    keys[j] = Integer.MAX_VALUE; setOfMST[j] = false;
  }
  keys[0] = 0; // it select as first vertex
  mstArray[0] = -1; // set first value of mstArray to -1 to make it root of MST
  for (int i = 0; i < countOfVertices - 1; i++) {
  int edge = findMinKeyVertex(keys, setOfMST);
  setOfMST[edge] = true;
  for (int vertex = 0; vertex < countOfVertices; vertex++)

  if (graphArray[edge][vertex] != 0 && setOfMST[vertex] == false && graphArray[edge][vertex] < keys[vertex]) {
  mstArray[vertex] = edge;
  keys[vertex] = graphArray[edge][vertex]; }
  }
  showMinimumSpanningTree(mstArray, graphArray); }
  public static void main(String[] args) {
  Main mst = new Main();
  int graphArray[][] = new int[][]{
      { 0, 4, 0, 0, 0, 0, 0, 8, 0 },
   { 4, 0, 8, 0, 0, 0, 0, 11, 0 },
   { 0, 8, 0, 7, 0, 4, 0, 0, 2 },
   { 0, 0, 7, 0, 9, 14, 0, 0, 0 },
   { 0, 0, 0, 9, 0, 10, 0, 0, 0 },
   { 0, 0, 4, 14, 10, 0, 2, 0, 0 },
   { 0, 0, 0, 0, 0, 2, 0, 1, 6 },
   { 8, 11, 0, 0, 0, 0, 1, 0, 7 },
   { 0, 0, 2, 0, 0, 0, 6, 7, 0 }};
  mst.designMST(graphArray); }
  }
```

```java
import java.lang.*;
import java.util.*;
import java.io.*;
class Main {
  private static final
  int countOfVertices = 9;
  int findMinKeyVertex(int keys[], Boolean setOfMST[]) {
  int minimum_index = -1;
  int minimum_value = Integer.MAX_VALUE;
  for (int vertex = 0; vertex < countOfVertices; vertex++)
  if (setOfMST[vertex] == false && keys[vertex] < minimum_value)
  {
    minimum_value = keys[vertex];
    minimum_index = vertex;

    }
```

input

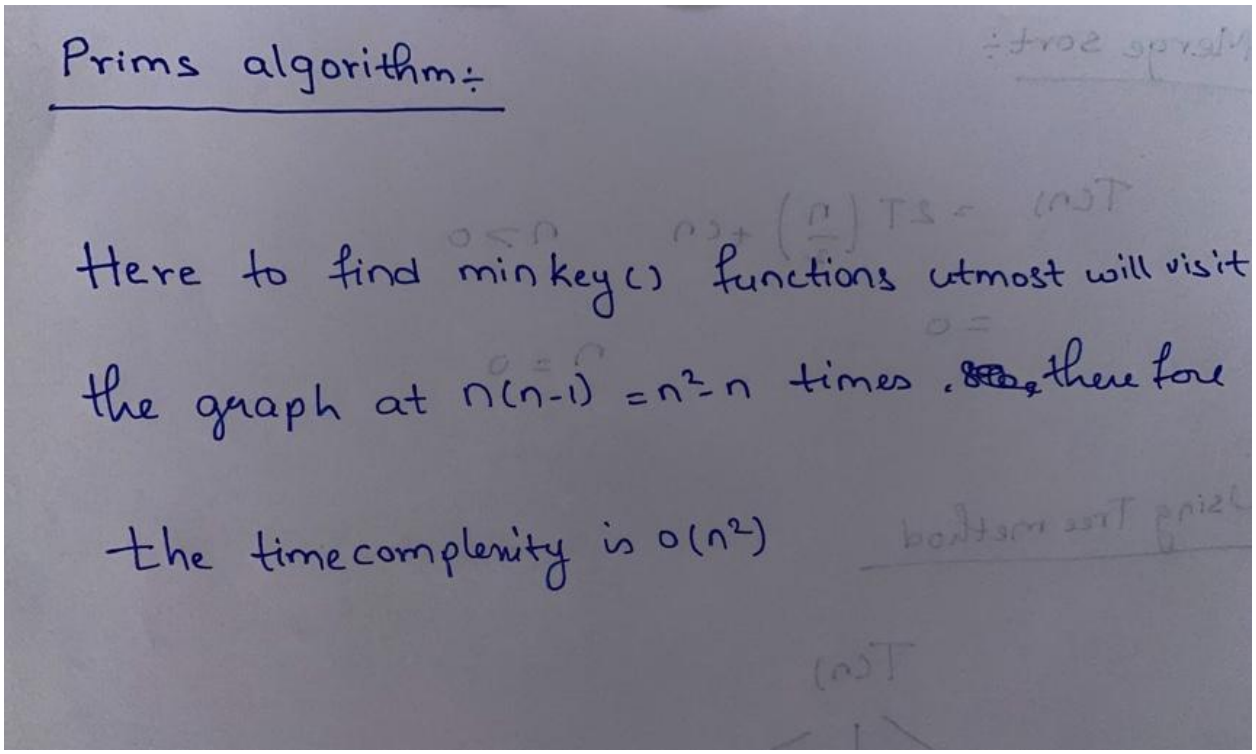
```
Edge              Weight
0 <-> 1           4
1 <-> 2           8
2 <-> 3           7
3 <-> 4           9
2 <-> 5           4
5 <-> 6           2
6 <-> 7           1
2 <-> 8           2


...Program finished with exit code 0
Press ENTER to exit console.
```

input

Edge Weight
0 <-> 1 4
1 <-> 2 8
2 <-> 3 7
3 <-> 4 9
2 <-> 5 4
5 <-> 6 2
6 <-> 7 1
2 <-> 8 2

...Program finished with exit code 0
Press ENTER to exit console.

ANALYSIS:


Prims algorithm:-
Here to find minkey() functions utmost will visit
the graph at n(n-1) = n²-n times. therefore
the timecomplexity is o(n²)