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**Assignment no :3**

**Problem Statement :**

Implement Greedy search algorithm for any of the following application:

I. Selection Sort

II. Minimum Spanning Tree

III. Single-Source Shortest Path Problem

IV. Job Scheduling Problem

V. Prim's Minimal Spanning Tree Algorithm

VI. Kruskal's Minimal Spanning Tree Algorithm

VII. Dijkstra's Minimal Spanning Tree Algorithm

**code :**

Prim's Minimal Spanning Tree Algorithm :

// A C++ program for Prim's Minimum

// Spanning Tree (MST) algorithm. The program is

// for adjacency matrix representation of the graph

#include <bits/stdc++.h>

using namespace std;

// Number of vertices in the graph

#define V 5

// A utility function to find the vertex with

// minimum key value, from the set of vertices

// not yet included in MST

int minKey(int key[], bool mstSet[])

{

// Initialize min value

int min = INT\_MAX, min\_index;

for (int v = 0; v < V; v++)

if (mstSet[v] == false && key[v] < min)

min = key[v], min\_index = v;

return min\_index;

}

// A utility function to print the

// constructed MST stored in parent[]

void printMST(int parent[], int graph[V][V])

{

cout<<"Edge \tWeight\n";

for (int i = 1; i < V; i++)

cout<<parent[i]<<" - "<<i<<" \t"<<graph[i][parent[i]]<<" \n";

}

// Function to construct and print MST for

// a graph represented using adjacency

// matrix representation

void primMST(int graph[V][V])

{

// Array to store constructed MST

int parent[V];

// Key values used to pick minimum weight edge in cut

int key[V];

// To represent set of vertices included in MST

bool mstSet[V];

// Initialize all keys as INFINITE

for (int i = 0; i < V; i++)

key[i] = INT\_MAX, mstSet[i] = false;

// Always include first 1st vertex in MST.

// Make key 0 so that this vertex is picked as first vertex.

key[0] = 0;

parent[0] = -1; // First node is always root of MST

// The MST will have V vertices

for (int count = 0; count < V - 1; count++)

{

// Pick the minimum key vertex from the

// set of vertices not yet included in MST

int u = minKey(key, mstSet);

// Add the picked vertex to the MST Set

mstSet[u] = true;

// Update key value and parent index of

// the adjacent vertices of the picked vertex.

// Consider only those vertices which are not

// yet included in MST

for (int v = 0; v < V; v++)

// graph[u][v] is non zero only for adjacent vertices of m

// mstSet[v] is false for vertices not yet included in MST

// Update the key only if graph[u][v] is smaller than key[v]

if (graph[u][v] && mstSet[v] == false && graph[u][v] < key[v])

parent[v] = u, key[v] = graph[u][v];

}

// print the constructed MST

printMST(parent, graph);

}

// Driver code

int main()

{

/\* Let us create the following graph

2 3

(0)--(1)--(2)

| / \ |

6| 8/ \5 |7

| / \ |

(3)-------(4)

9 \*/

int graph[V][V] = { { 0, 2, 0, 6, 0 },

{ 2, 0, 3, 8, 5 },

{ 0, 3, 0, 0, 7 },

{ 6, 8, 0, 0, 9 },

{ 0, 5, 7, 9, 0 } };

// Print the solution

primMST(graph);

return 0;

}

**Output :**

