**Practical No.7**

**Graph: Minimum Spanning Tree**

**Program Code:-**

**B)** **Kruskal’s algorithm**

#include<iostream>

#define INFINITY 999

using namespace std;

class kruskal

{

typedef struct graph

{

int v1,v2,cost;

}GR;

GR G[20];

public:

int tot\_edges,tot\_nodes;

void create();

void spanning\_tree();

void get\_input();

int minimum(int);

};

int find(int v2,int parent[])

{

while(parent[v2]!=v2)

{

v2=parent[v2];

}

return v2;

}

void un(int i,int j,int parent[])

{

if(i<j)

parent[j]=i;

else

parent[i]=j;

}

void kruskal::get\_input()

{

cout<<"\nEnter total number of nodes ";

cin>>tot\_nodes;

cout<<"\nEnter total number of edges ";

cin>>tot\_edges;

}

void kruskal::create()

{

for(int k=0;k<tot\_edges;k++)

{

cout<<"\nEnter edges in (v1,v2) form: ";

cin>>G[k].v1>>G[k].v2;

cout<<"\nEnter corresponding cost ";

cin>>G[k].cost;

}

}

int kruskal::minimum(int n)

{

int i,small,pos;

small=INFINITY;

pos=-1;

for(i=0;i<n;i++)

{

if(G[i].cost<small)

{

small=G[i].cost;

pos=i;

}

}

return pos;

}

void kruskal::spanning\_tree()

{

int count,k,v1,v2,i,j,tree[10][10],pos,parent[10];

int sum;

count=0;

k=0;

sum=0;

for(i=0;i<tot\_nodes;i++)

parent[i]=i;

while(count!=tot\_nodes-1)

{

pos=minimum(tot\_edges);

if(pos==-1)

break;

v1=G[pos].v1;

v2=G[pos].v2;

i=find(v1,parent);

j=find(v2,parent);

if(i!=j)

{

tree[k][0]=v1;

tree[k][1]=v2;

k++;

count++;

sum+=G[pos].cost;

un(i,j,parent);

}

G[pos].cost=INFINITY;

}

if(count==tot\_nodes-1)

{

cout<<"\nSpanning tree is: \n";

cout<<"\n---------------------------- \n";

for(i=0;i<tot\_nodes-1;i++)

{

cout<<"|"<<tree[i][0];

cout<<" ";

cout<<tree[i][1]<<"|"<<endl;

}

cout<<"\n---------------------------- \n";

cout<<"cost of spanning tree is: "<<sum<<endl;

}

else

{

cout<<"there is no spanning tree "<<endl;

}

}

int main()

{

kruskal obj;

cout<<"\n\t Graph creation ";

obj.get\_input();

obj.create();

obj.spanning\_tree();

return 0;

}