A SEMINAR ON

PRIM'S ALGORITHM FOR MINIMAL SPANNING TREE

DEPARTMENT OF APPLIED MATHEMATICS

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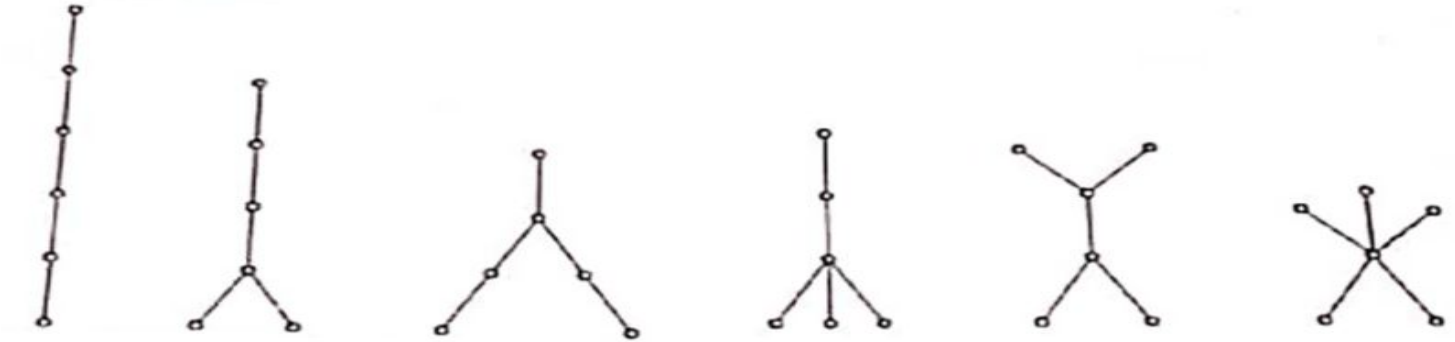
Introduction

Tree is a special type of relation that is useful in a variety of computer science application and is usually represented by its digraph. These relations are essential for the construction of databases and Language Compilers. Trees are the most important graphs in graph theory. Many of the applications of the graph theory , directly or indirectly ,involves trees . Trees are useful for describing any structure which involves hierarchy.

A tree is a connected acyclic graph. An acyclic graph is one that contains no cycles.A connected graph means ,it is possible to move along edges from any node to any other node.the trees on six vertices are shown in following figure.



Properties of trees

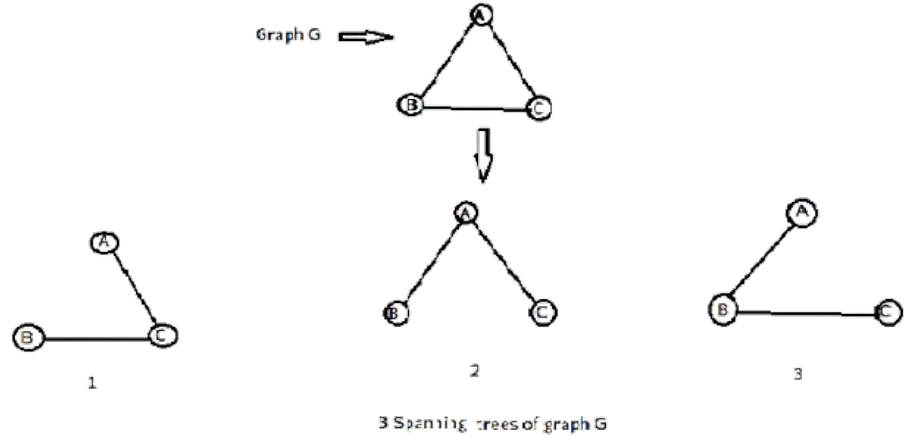
01. There is one and only one path between every pair of vertices in a tree ‘T’.
02. A tree with n vertices has n-1 edges.
03. A graph ‘G’ with n vertices , n-1 edges and no circuit is connected.
04. Any connected graph with n vertices and n-1 edges is a tree.
05. A graph is a tree if and only it is minimally connected.

Note:-

Minimally connected graph; A connected graph is said to minimally connected if removal of any one edge from it disconnects the graph.It is obvious that a minimally connected graph can’t have a circuit.Hence minimally connected graph is a tree.

Spanning Tree

A spanning tree is a subgraph of an undirected connected graph, which includes all the vertices of the graph with a minimum possible number of edges.If a vertex is missed,then it is not a spanning tree.The edges may or may not have weights assigned to them.

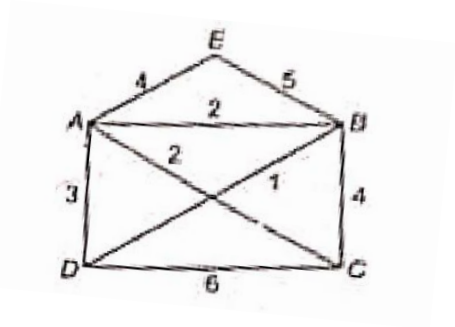


3 Spanning trees of graph G

Here we can see for graph 'G' has 3 vertices consist the 3 spanning tree and in each spanning tree consist n-1 = 3-1 = 2 number of edges according to the property of spanning tree.

Weighted Graph

A weighted graph is a graph 'G' in which each edge 'e' has been assigned a non-negative number w(e) called the weight of 'e' .Figure shows a weighted Graph:-



Minimal Spanning Tree

A spanning trees with the smallest weight in a weighted graph is called minimal spanning tree.

Algorithm For Minimal Spanning Tree

There are several methods for finding a minimal spanning tree in a given graph. Kruskal's and Prim's algorithms are available to find the minimal spanning tree.

A.Prim's Algorithm

Prim's algorithm to find a shortest spanning tree in a given graph is as follows

01.Draw n isolated vertices and label them $v_1, v_2, v_3, \ldots v_n$.

02.Tabulate the given weights of the edges of G in an nxn table. Set the weights Of non existent edges as very large.

03.Start from vertex v_1 and connect it to its nearest neighbour ,i.e,to the vertex

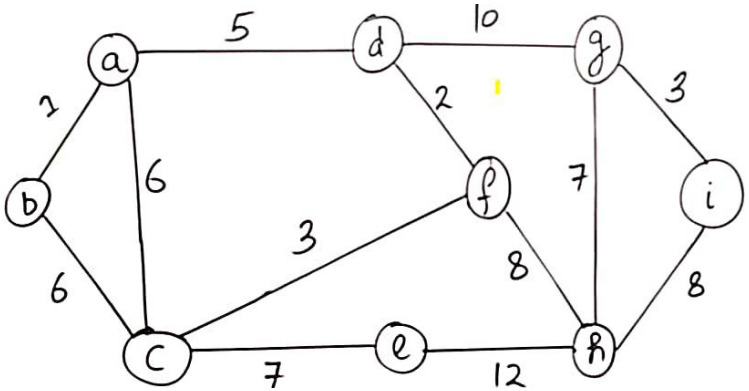
which has the smallest entry in row 1 of the table say V_k.

04. Consider V_i and V_k as one subgraph and connect this subgraph to its closest neighbour i.e. to a vertex other than v_1 and v_k that has the smallest entry among all entries in row 1 and k . Let the new vertex is v_i .

05. Consider the tree with vertices v_1 ,v_k and v_i as one subgraph and continue the process until all n vertices have been connected by n-1 edges.

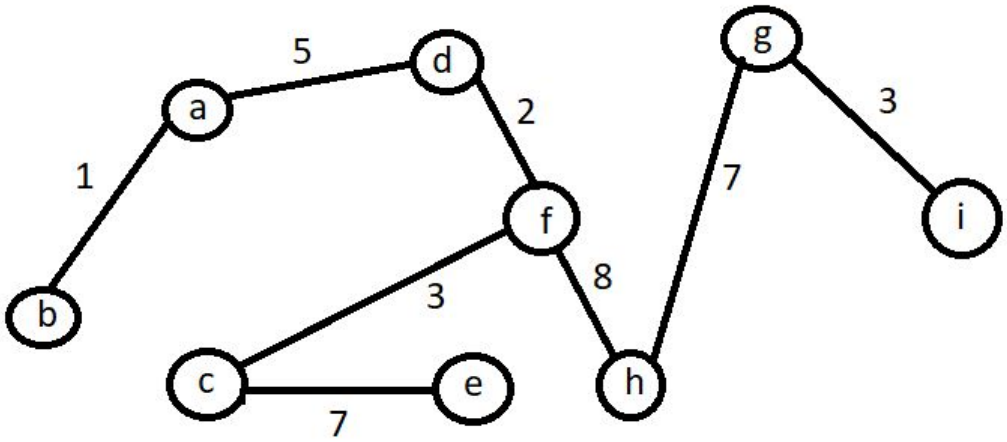
Example:-

Find the minimal spanning tree of the following weighted graph shown in figure using Prim's algorithm.



Solution:-

	a	b	c	d	e	f	g	h	i
a	-	1	6	5	∞	∞	∞	∞	∞
b	1	-	6	∞	∞	∞	∞	∞	∞
c	6	6	-	∞	7	3	∞	∞	∞
d	5	∞	∞	-	∞	2	10	∞	∞
e	∞	∞	7	∞	-	∞	∞	12	∞
f	∞	∞	3	2	∞	-	∞	8	∞
g	∞	∞	∞	10	∞	∞	-	7	3
h	∞	∞	∞	∞	12	8	7	-	8
i	∞	∞	∞	∞	∞	∞	3	8	-



This is the minimal spanning and the minimal cost = 1+5+2+3+7+8+7+3 = 36

THANK YOU