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Subject :- DM

DM Assignment No :- 5

Q.1) Define following terms :-

a) Trees :- A tree is a connected undirected graph with no simple circuits.

b) Forest :- A forest is an undirected graph in which any vertices are connected by at most one path.

c) leaf node :- A vertex of rooted tree is called a leaf node if it has no children.

d) Branch node :- Branch node is any node of a tree that has child nodes.

e) Ancestors :- The Ancestors of a vertex other than the root are the vertices in the path from the root to this vertex, excluding the vertex itself and including the root.

f) Siblings :- Vertices with the same parent is called siblings.

g) Subtree :- If a is a vertex in a tree, the subtree with a as its root is the subgraph of the tree consisting of a and its descendants and all edges incident to these descendants.

h) Digraph :- A directed graph, also called a digraph is a graph in which the edges have a direction.

(Q.2) Explain Binary Search tree with example

Ans Binary Search tree :

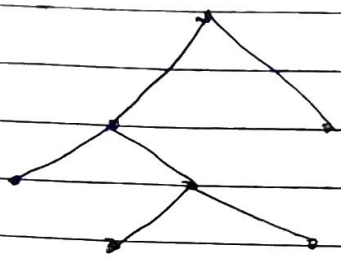
Binary Search tree is a binary tree where a the nodes are arranged in a order. The order is.

a) all the value in the left sub tree has a value less than that of the right value.

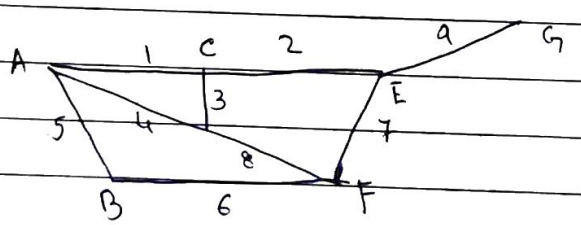
b) The same rule is carried forward to all the sub-tree in tree

c) All the value in the right node has a value greater than value of root node.

eg :-



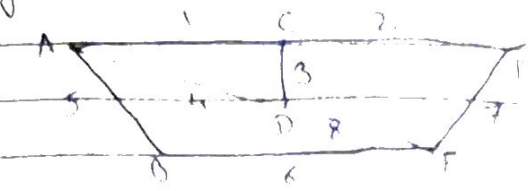
(Q.3) Define minimum Spanning tree and find minimum Spanning tree for given graph using prim's and Kruskal's algorithm.



Ans a) Minimum Spanning tree

A minimum Spanning tree in a connected weighted graph is a Spanning tree that has possible sum of degree weights of its edges.

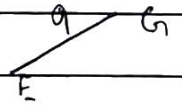
b) Prim's Algorithm



Step 1 :- Here, edges m = 8
vertices n = 7

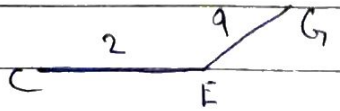
Step 2 :- Choosing G as a starting vertex
from G, $w(G, E) = 9$
$w(G, C) = \infty$
$w(G, A) = \infty$
$w(G, B) = \infty$
$w(G, D) = \infty$
$w(G, F) = \infty$

From above $w(G, E) = 9$ is minimum.
Therefore, we choose G to E path.



Step 3 :- from E
$w(E, C) = 2$
$w(E, F) = 7$
$w(E, A) = \infty$
$w(E, D) = \infty$
$w(E, B) = \infty$

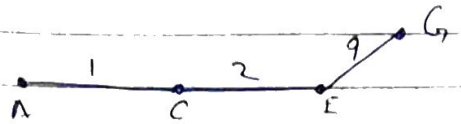
Here, $w(E, C) = 2$ is minimum, Therefore we choose E to C path.



Step 4: from C | from E | from G

from C	from E	from G
w(C, A) = 1	w(E, f) = 7	w(G, A) = ∞
w(C, B) = ∞	w(E, A) = ∞	w(G, B) = ∞
w(C, D) = 3	w(E, D) = ∞	w(G, D) = ∞
w(C, f) = ∞	w(E, B) = ∞	w(G, f) = ∞

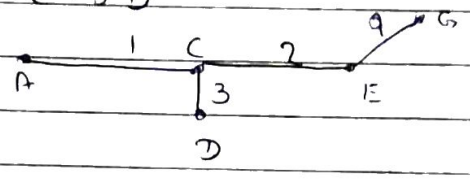
Here, w(C, A) = 1 is minimum, therefore we choose C to A path



Step 5: from A | from C | from E | from G

from A	from C	from E	from G
w(A, D) = 4	w(C, B) = ∞	w(E, E) = 7	w(G, B) = ∞
w(A, f) = ∞	w(C, D) = 3	w(E, D) = ∞	w(G, D) = ∞
w(A, B) = 5	w(C, f) = ∞	w(E, B) = ∞	w(G, f) = ∞

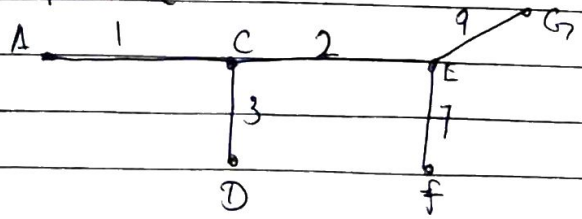
Here, w(C, b) = 3 is minimum, therefore we choose Path C to D



Step 6: from D

from D	from C	from E	from G
w(D, f) = 8			
w(D, B) = ∞	w(C, B) = ∞	w(E, F) = 7	w(G, B) = ∞
~~to f~~	w(C, B) = ∞	w(E, B) = ∞	w(G, B) = ∞

from above E to f = 7 is minimum, so we choose path E to f



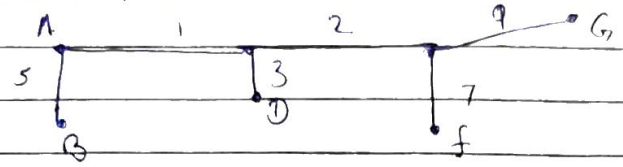
Step 7 : from F from A from C

$w(F,B)=6$ $w(A,B)=5$ $w(C,B)=\infty$

from E from G

$w(E,B)=\infty$ $w(G,B)=\infty$

from above $w(A,B)=5$ is minimum, so we choose path A to B.



Step 8 : minimum spanning tree cost - adding up of all the edges weight of spanning tree

$= 5+1+3+2+7+9$

$= 27$

c) Kruskal's Algorithm

Step 1 :- Here Vertices $n=7$

edges $m=8$

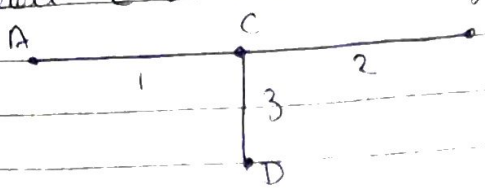
Step 2 :- listing of all the edges in ~~non~~ increasing order of their weight.

Edges	A-C	C-E	C-D	A-D	A-B	B-F	E-F	E-G
weight	1	2	3	4	5	6	7	9

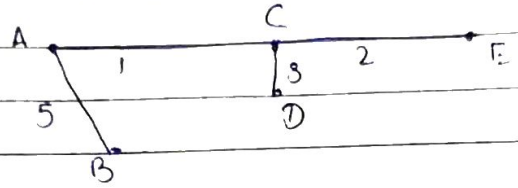
Step 3 :- Select A-C with weight 1

Step 4 :- Select C-E with weight 2

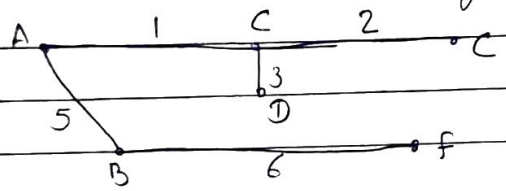
Step 5 :- Select C-D with weight 3



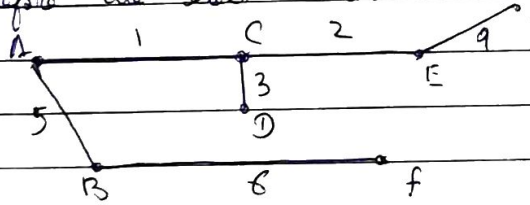
Step 6 :- If we choose A-D path, then circuit will be formed. So avoid it and select next path i.e select A-B



Step 7 :- Select B-f with weight 6



Step 8 :- If we choose E-f path, then circuit forms therefore we select next one i.e E-G with weight 9

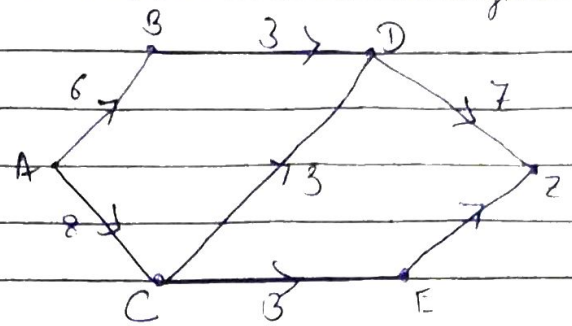


Step 9 :- minimum Spanning trees cost =

$= 5 + 1 + 3 + 2 + 9 + 6$

$= 26$

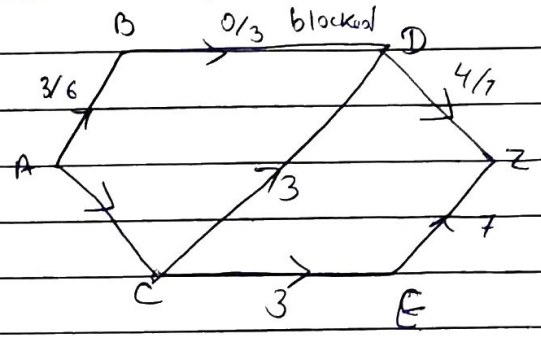
Q.4 Find out the maximum flow in a given transport network.



Ans Here A = Source , Z = Sink

path	flow
A → B → D → Z	3
A → C → E → Z	3
A → C → D → Z	3

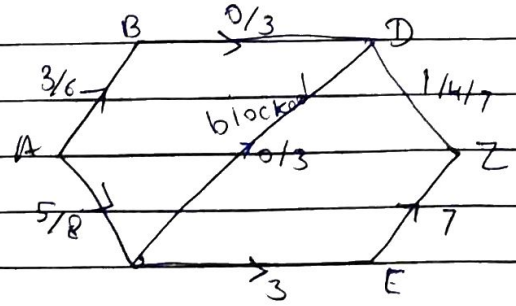
Step 1 :- Select Path from A → B → D → Z flow 3



Choose another path from a-Z

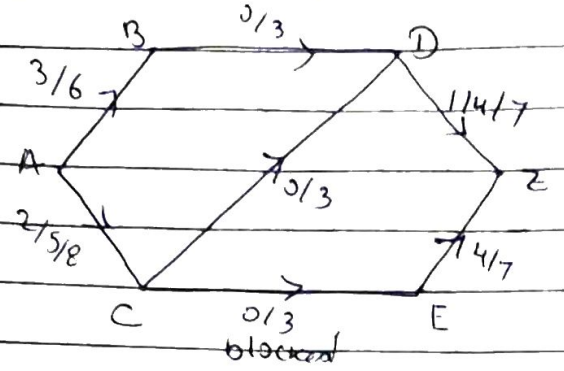
Step 2 :- Select Path from a-Z or ac

Path A → C → D → Z flow = 3



Step 3 :- Select Path without blocked edges to reach Z

Path A → C → E → Z flow = 3



Step 4 :- Now check table we prepared with flow and Path

Path	flow
A → B → D → Z	3
A → C → D → Z	3
A → C → E → Z	3
	9

So network have maximum flow

∴ Maximum flow in a transport network is 9.