

# **Girvan-Newman Algorithm to find Communities**

# *Girvan-Newman Algorithm*

- The *Girvan-Newman* technique for the detection and analysis of community structure depends upon the iterative elimination of edges with the highest number of the shortest paths that pass through them.
- Divisive hierarchical clustering based on edge betweenness: number of shortest paths passing through the edge

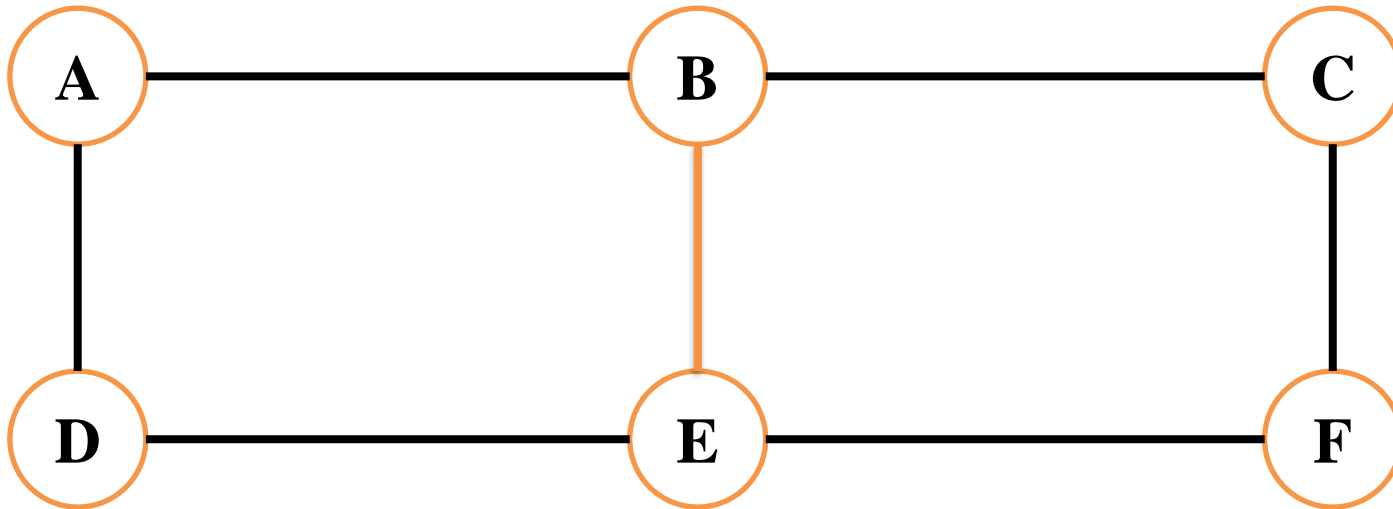
# *Girvan-Newman Algorithm*

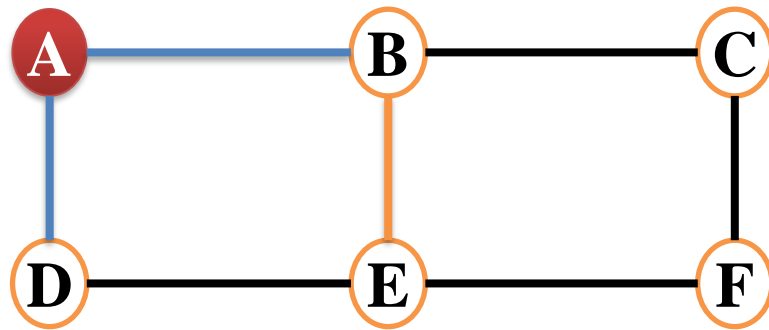
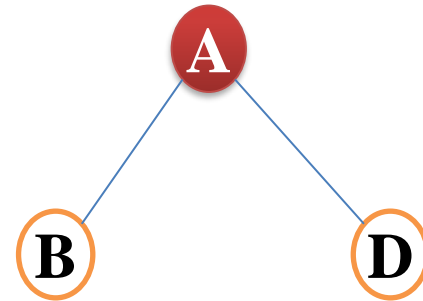
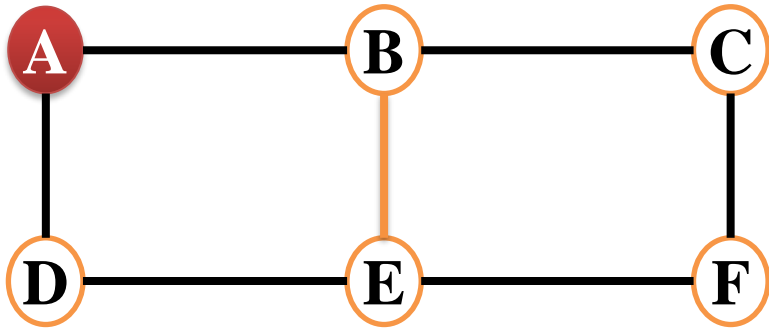
Repeat until no edge is left

1. Calculate edge betweenness for every edge in the graph.
2. Remove the edge with highest edge betweenness.
3. Calculate edge betweenness for remaining edges.
4. Connected components are communities.

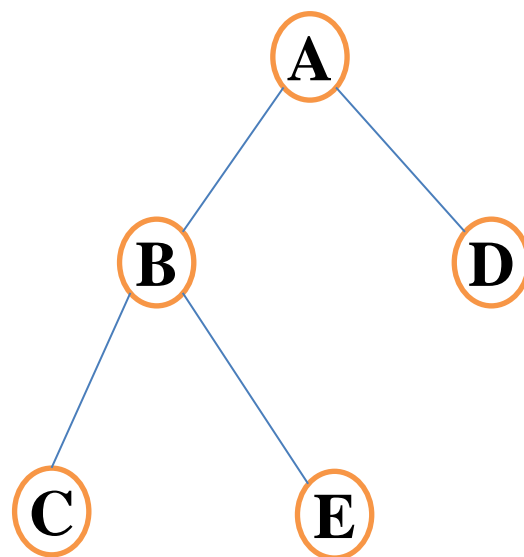
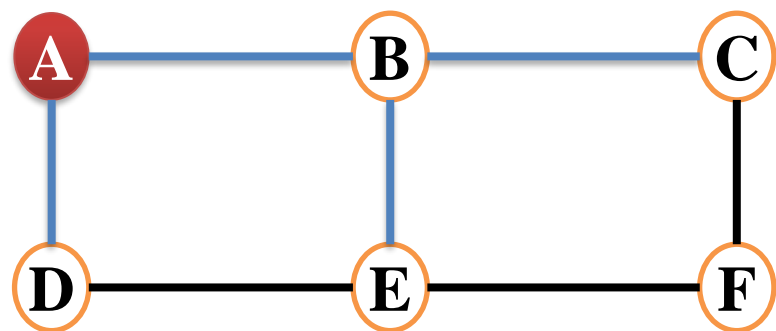
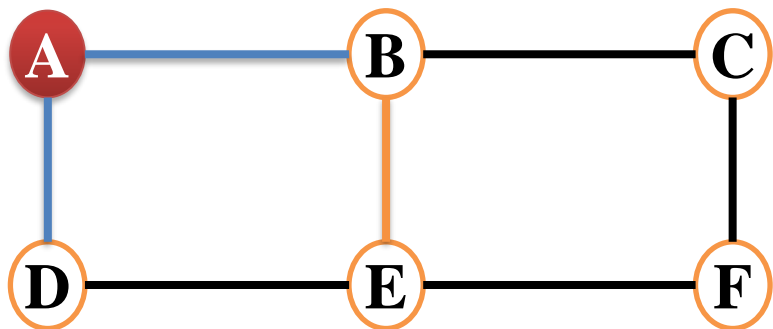
# Example

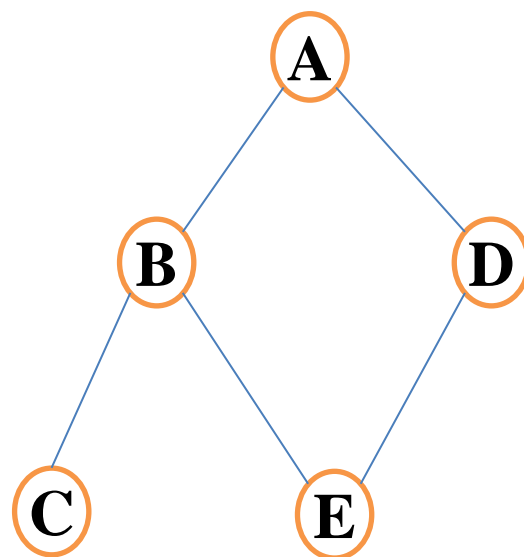
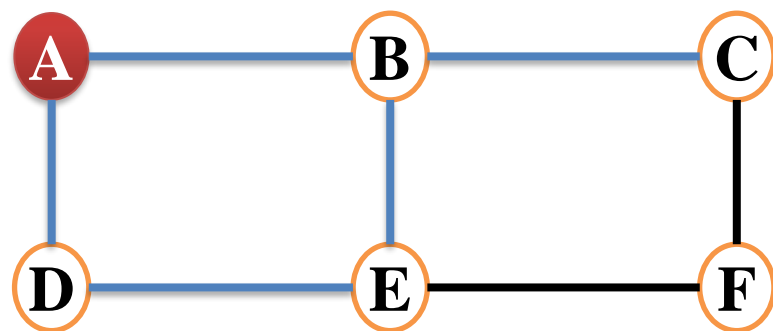
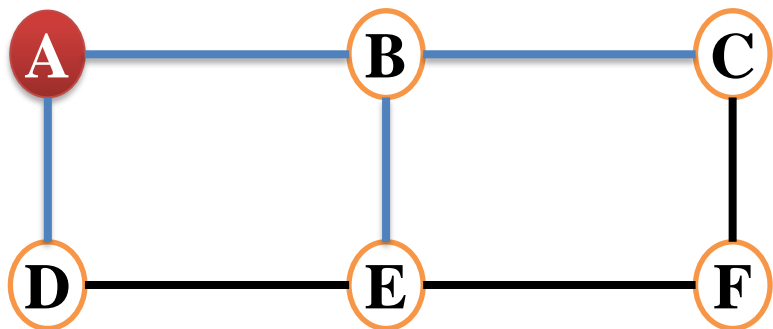
- Example: for the given graph calculate the betweenness centrality for the edges, solve using Girvan Newman.

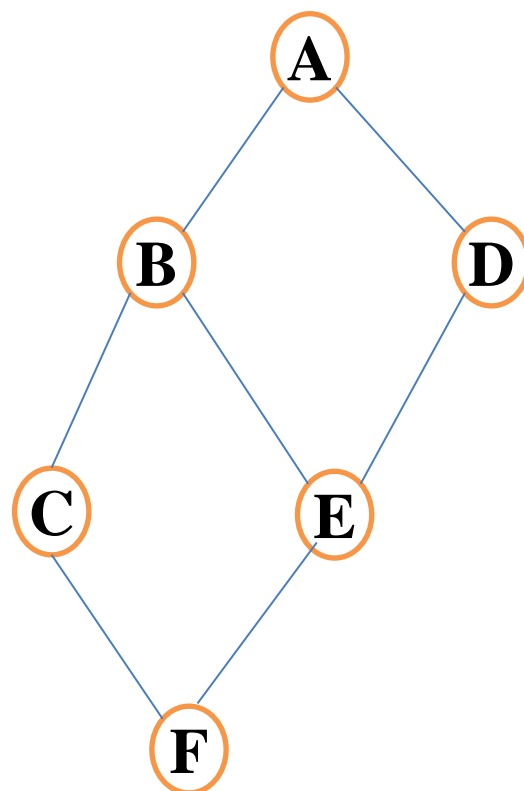
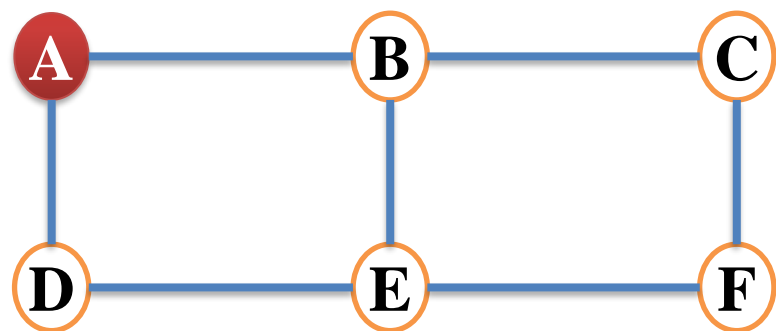
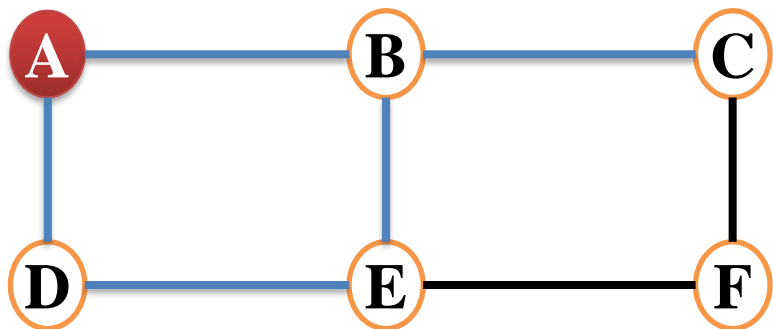




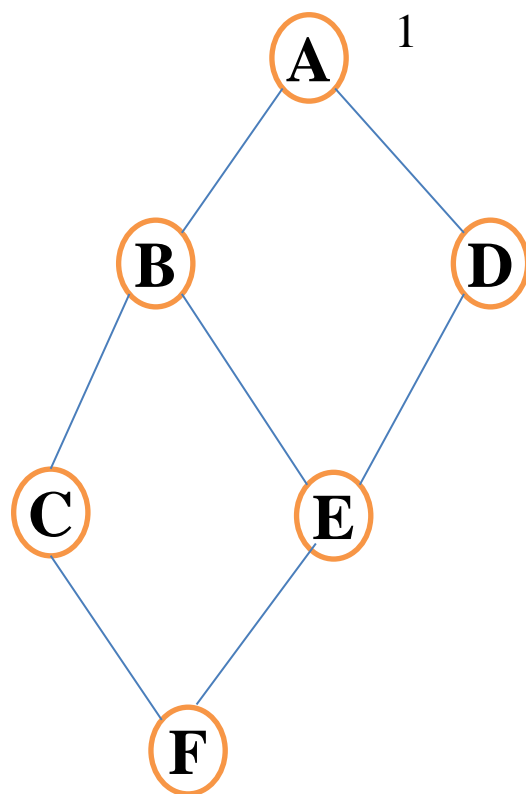
Applying BFS Algorithm

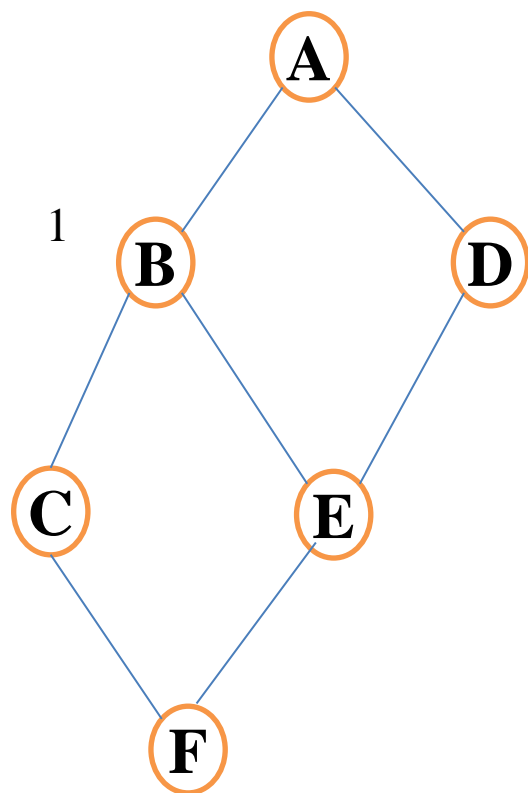


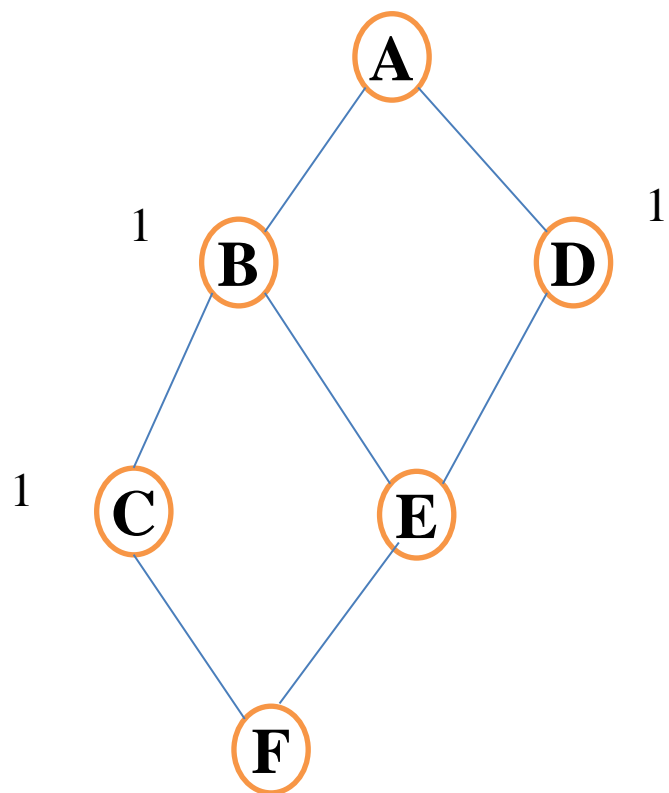


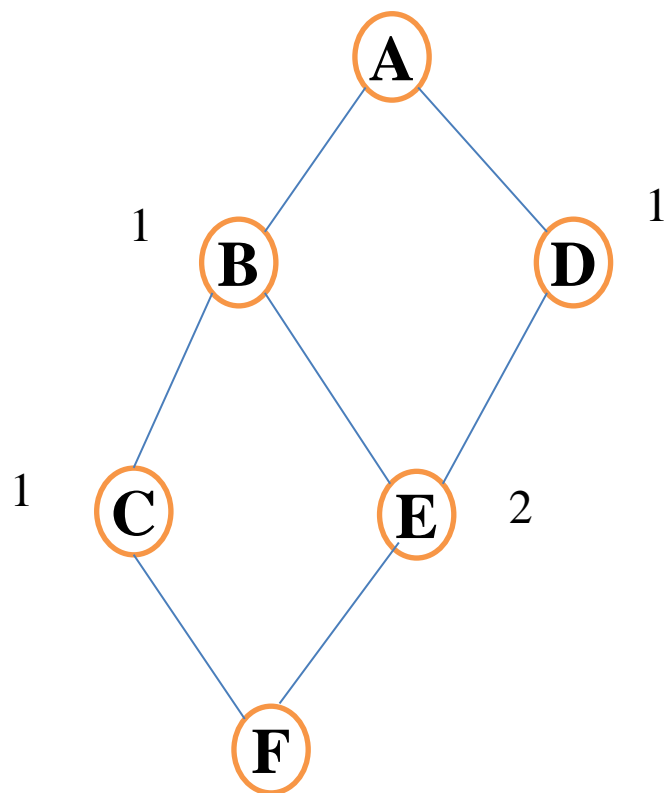


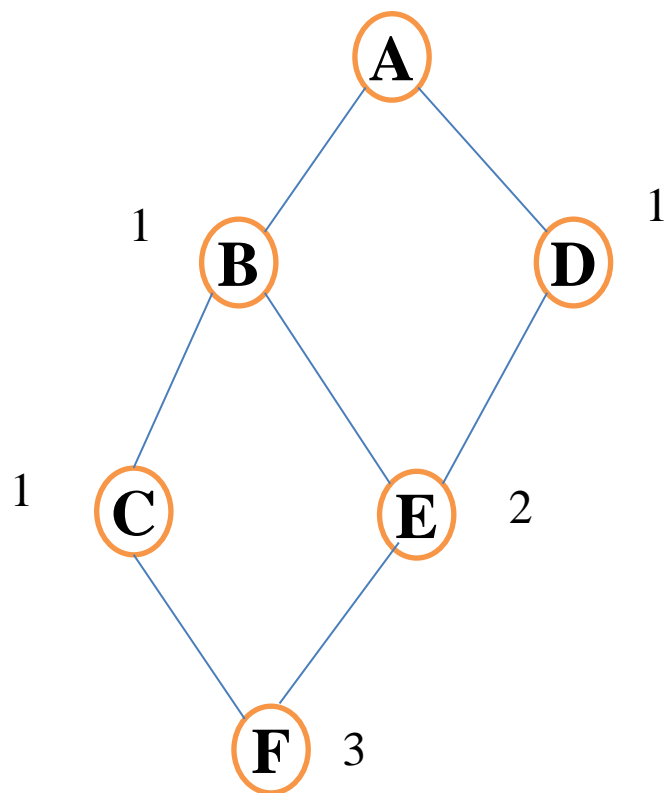


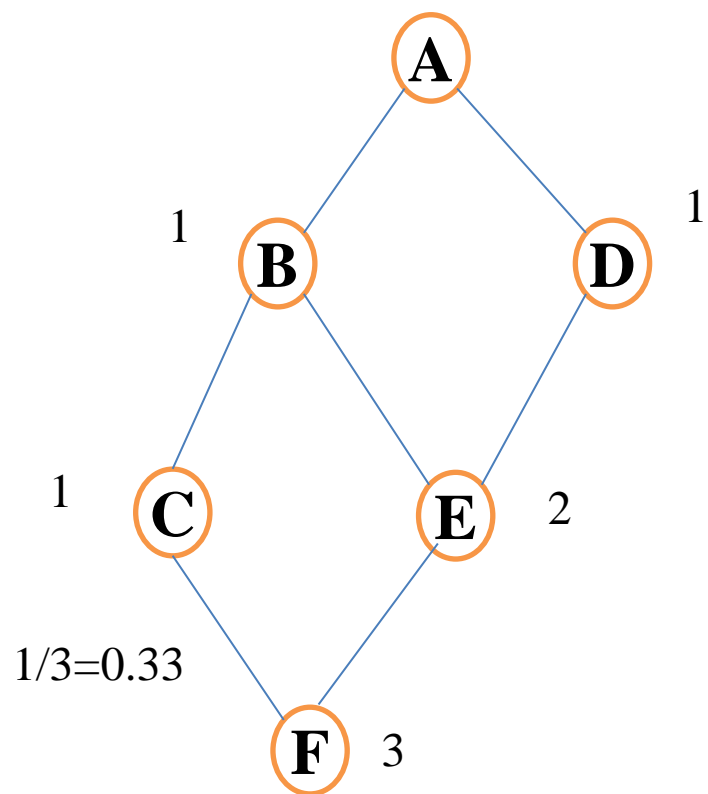


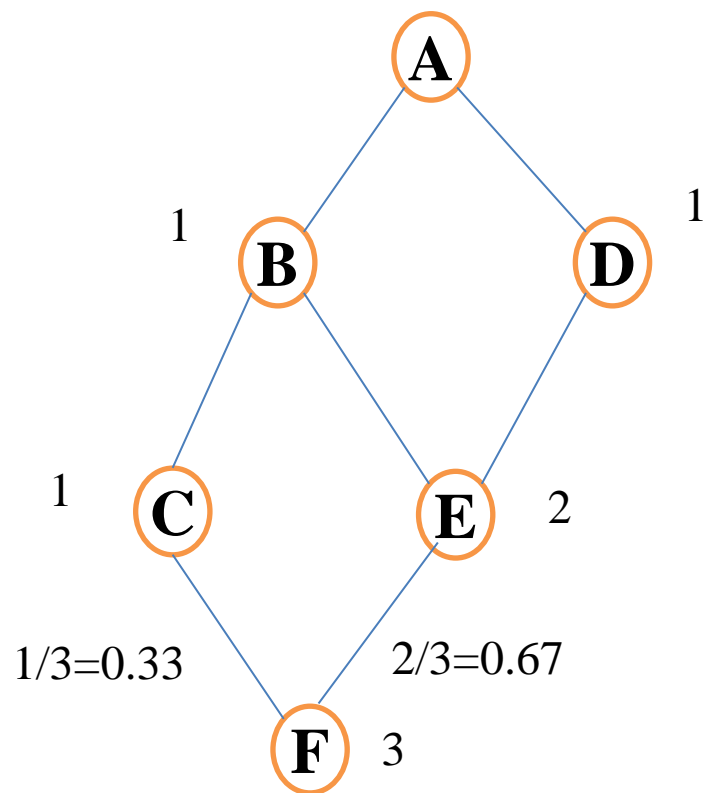


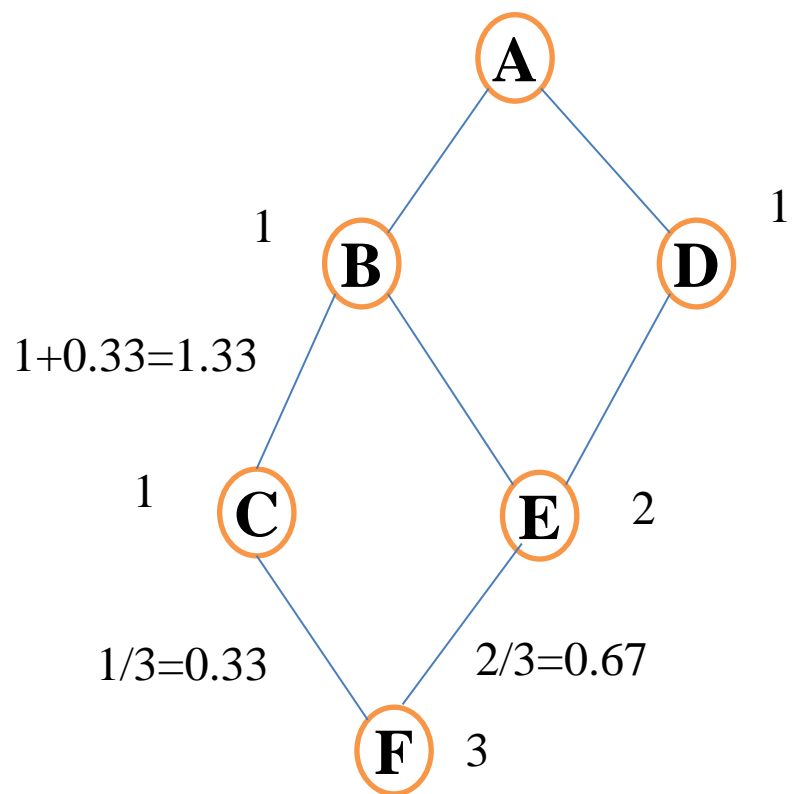




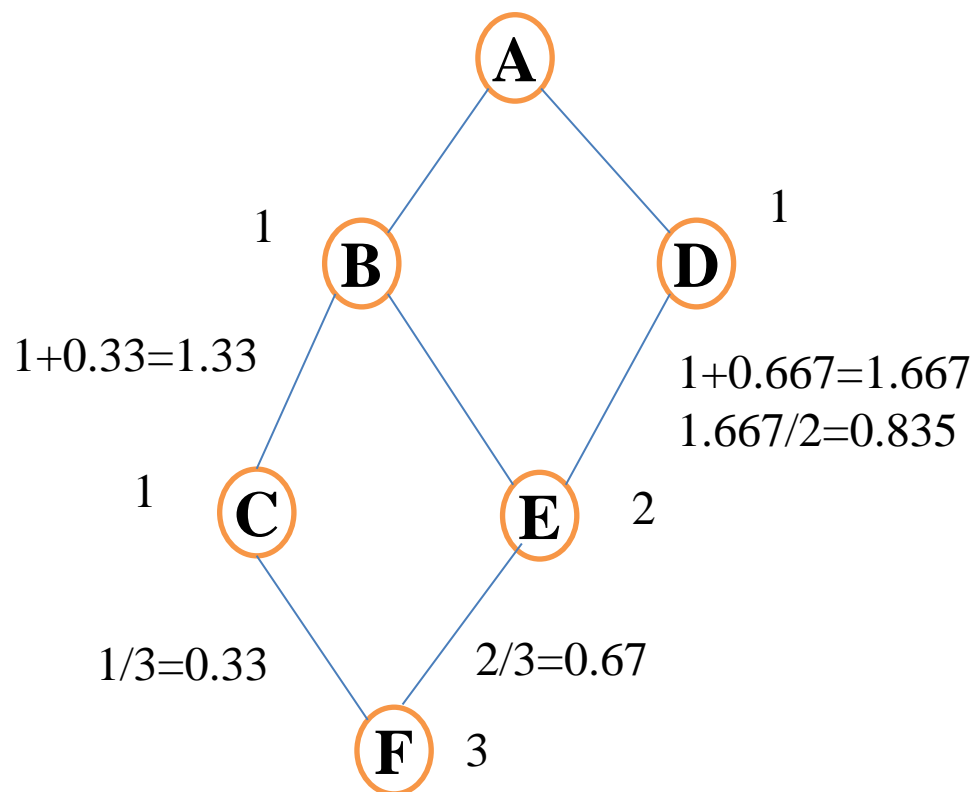


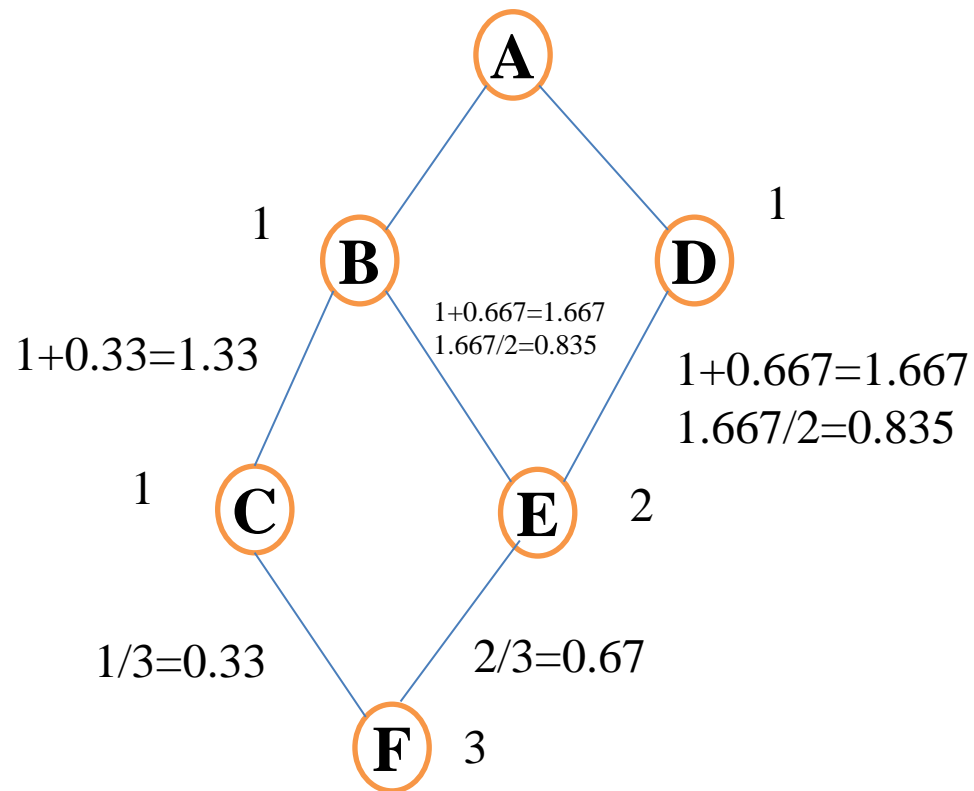


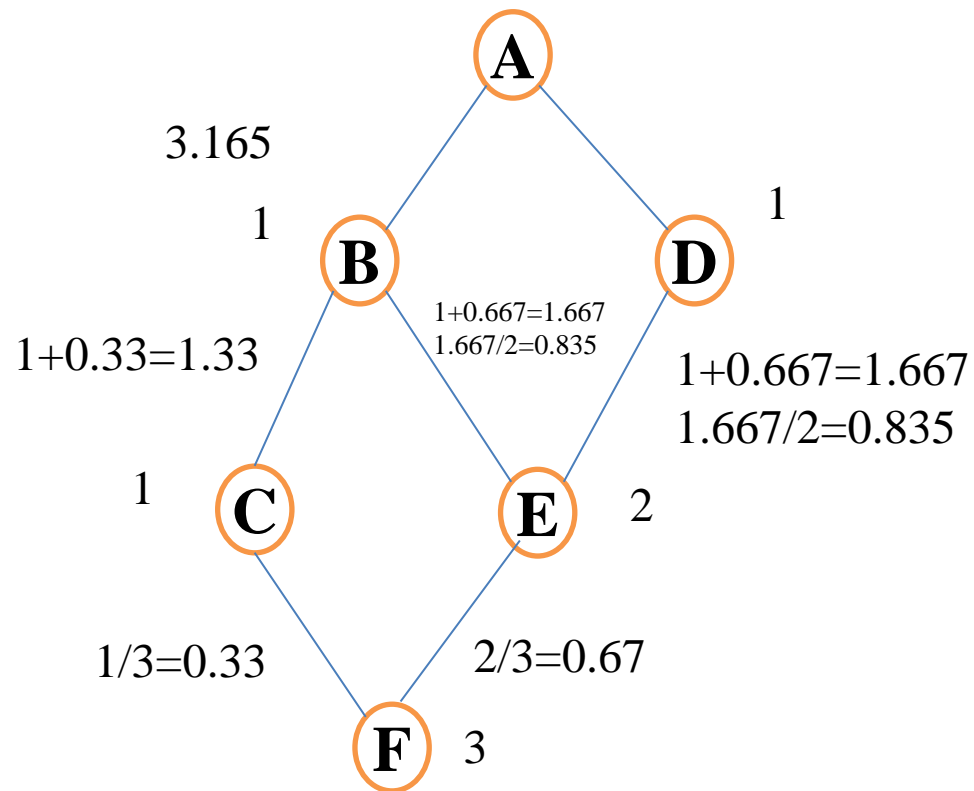


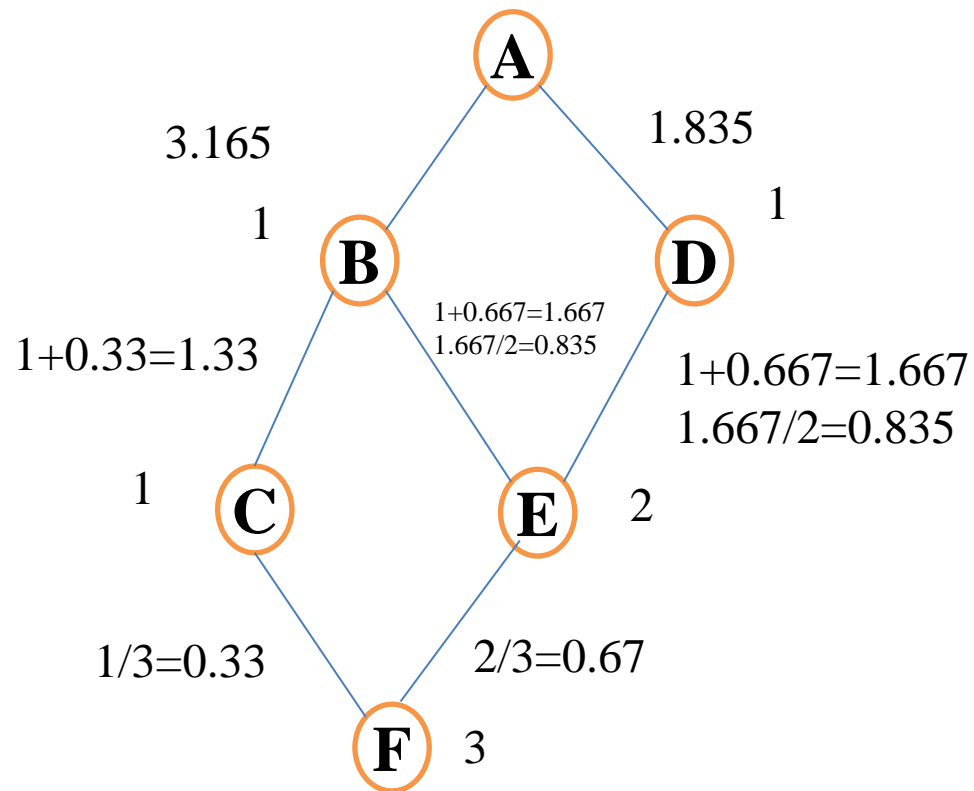


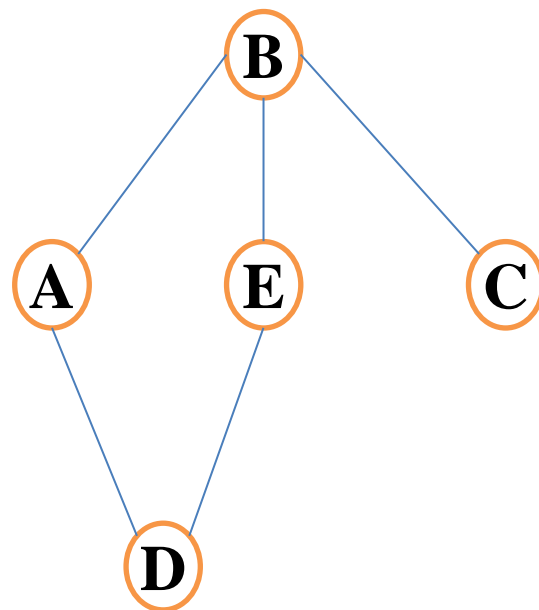
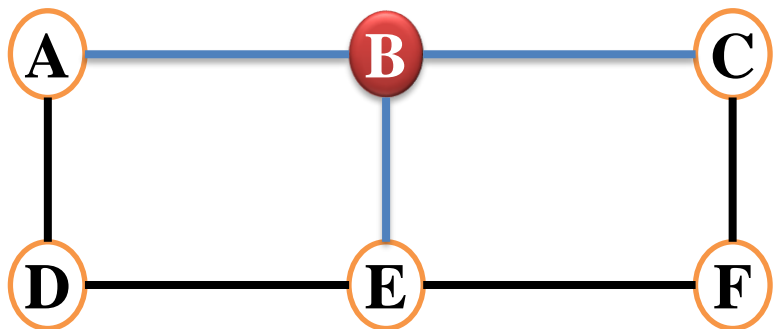


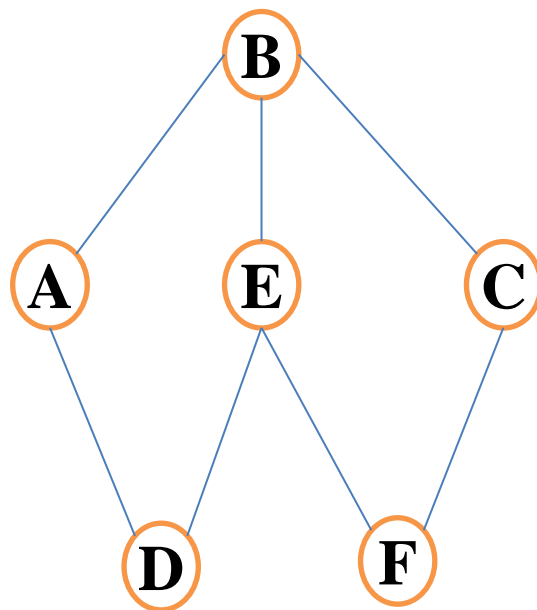
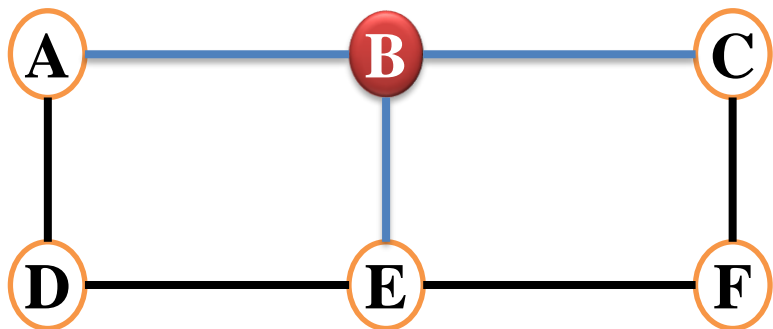


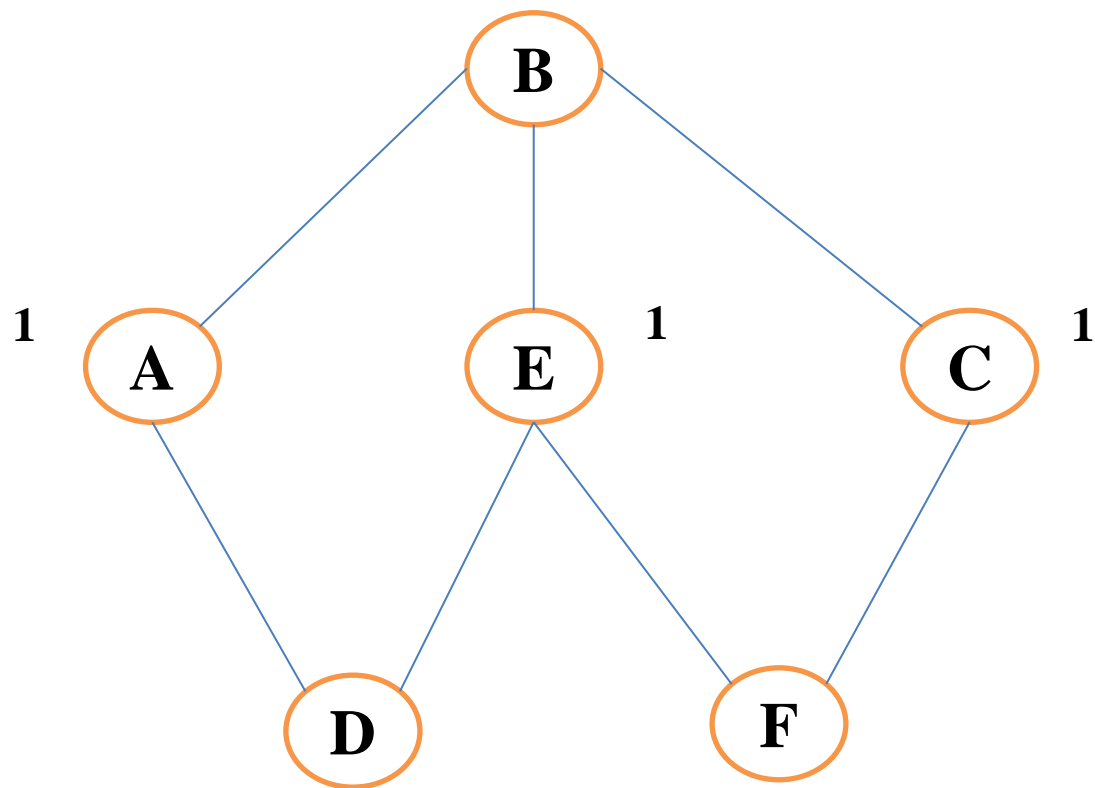


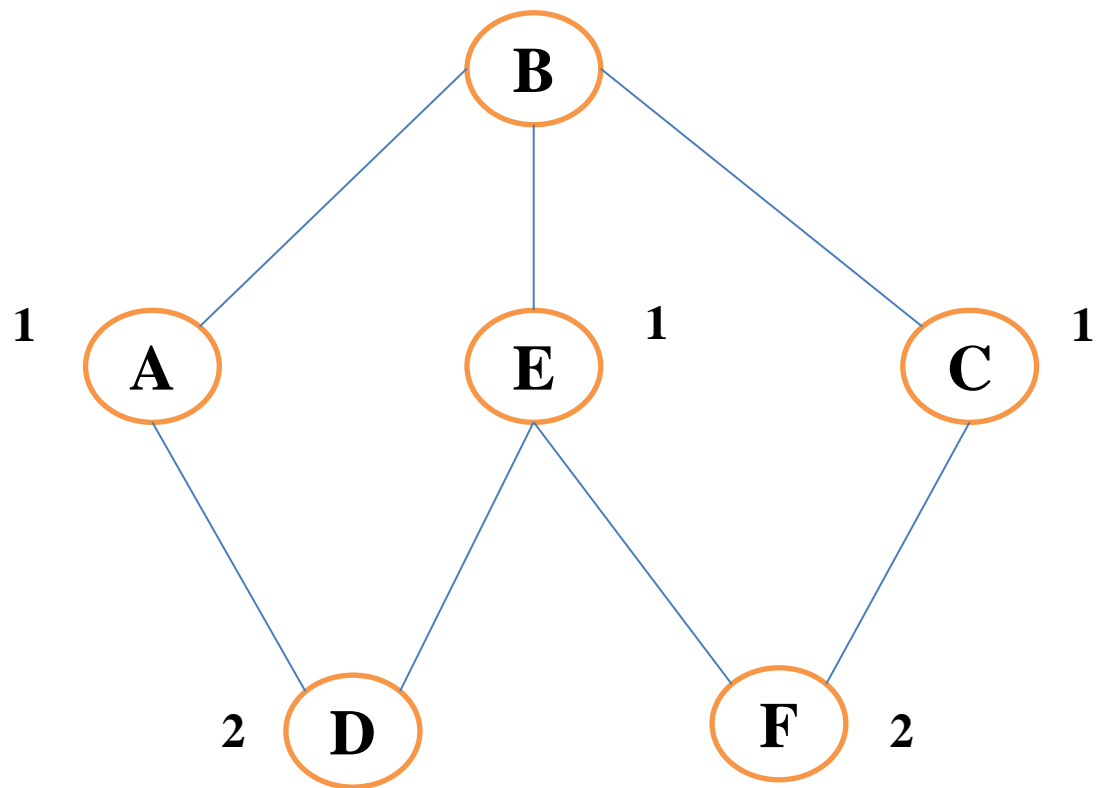




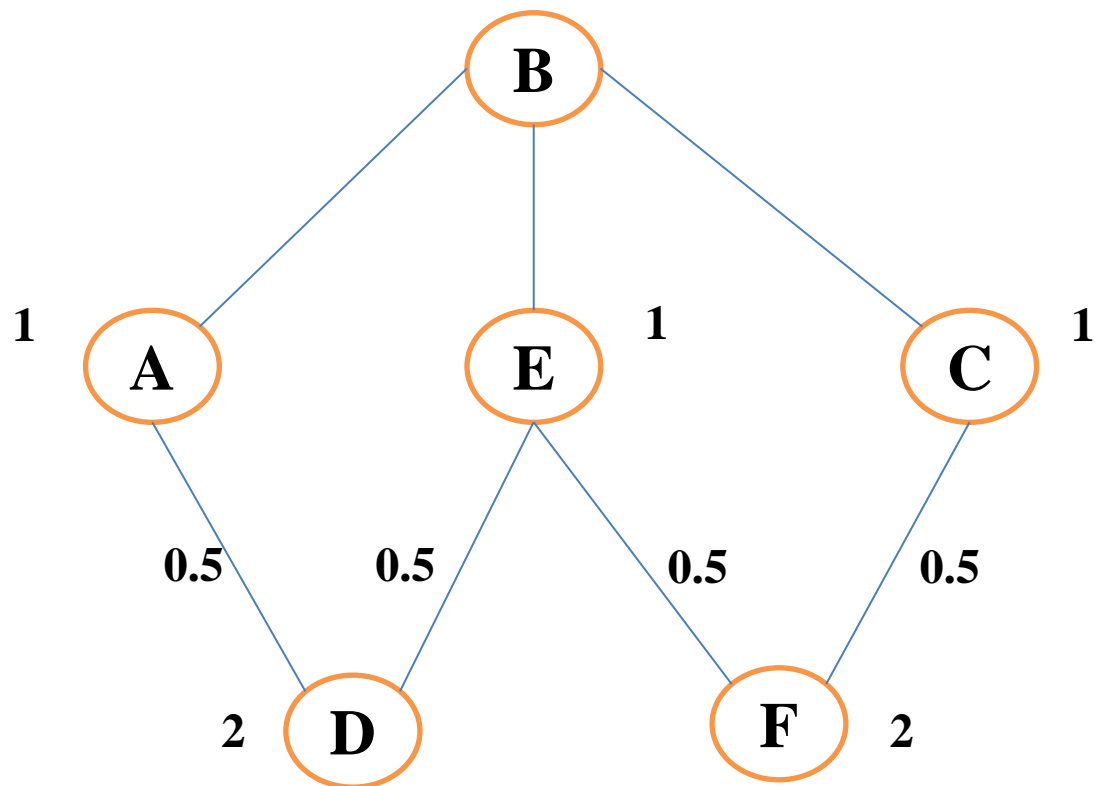


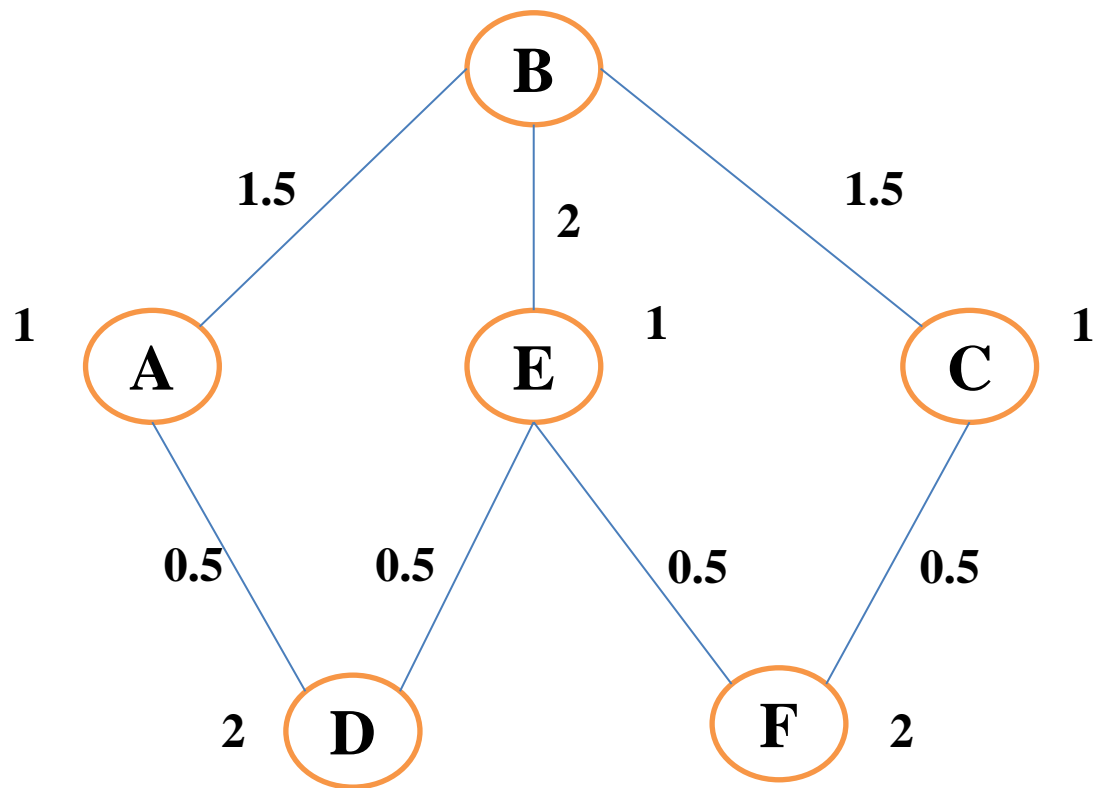


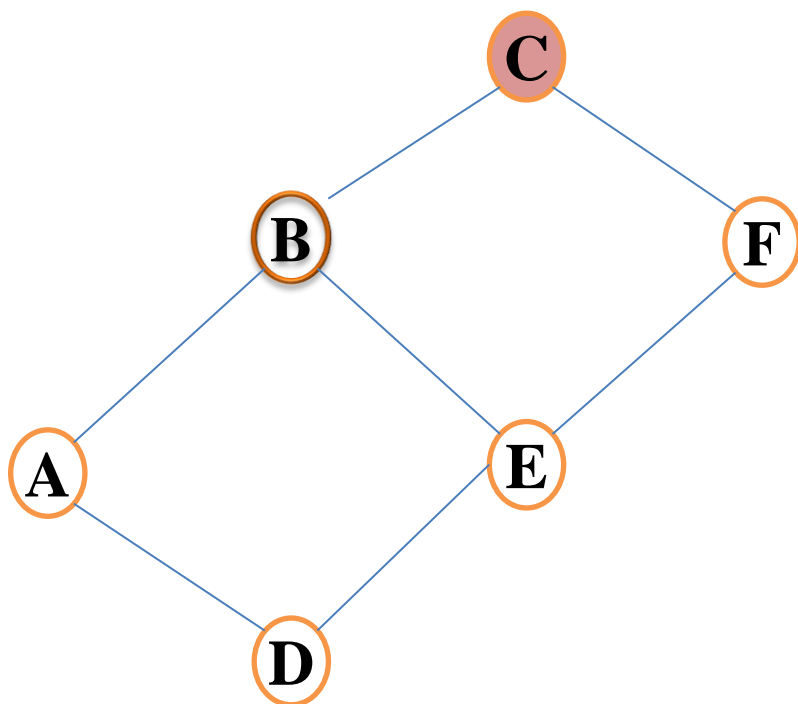
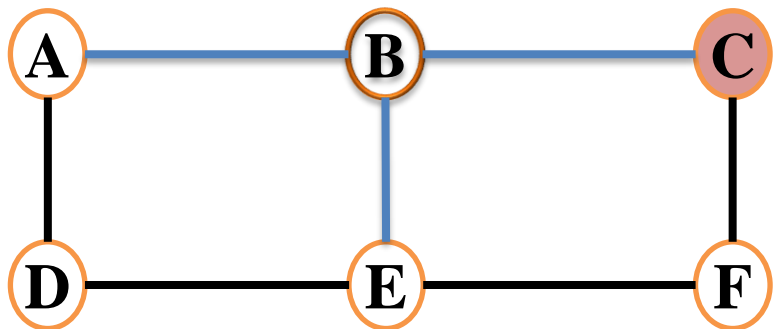


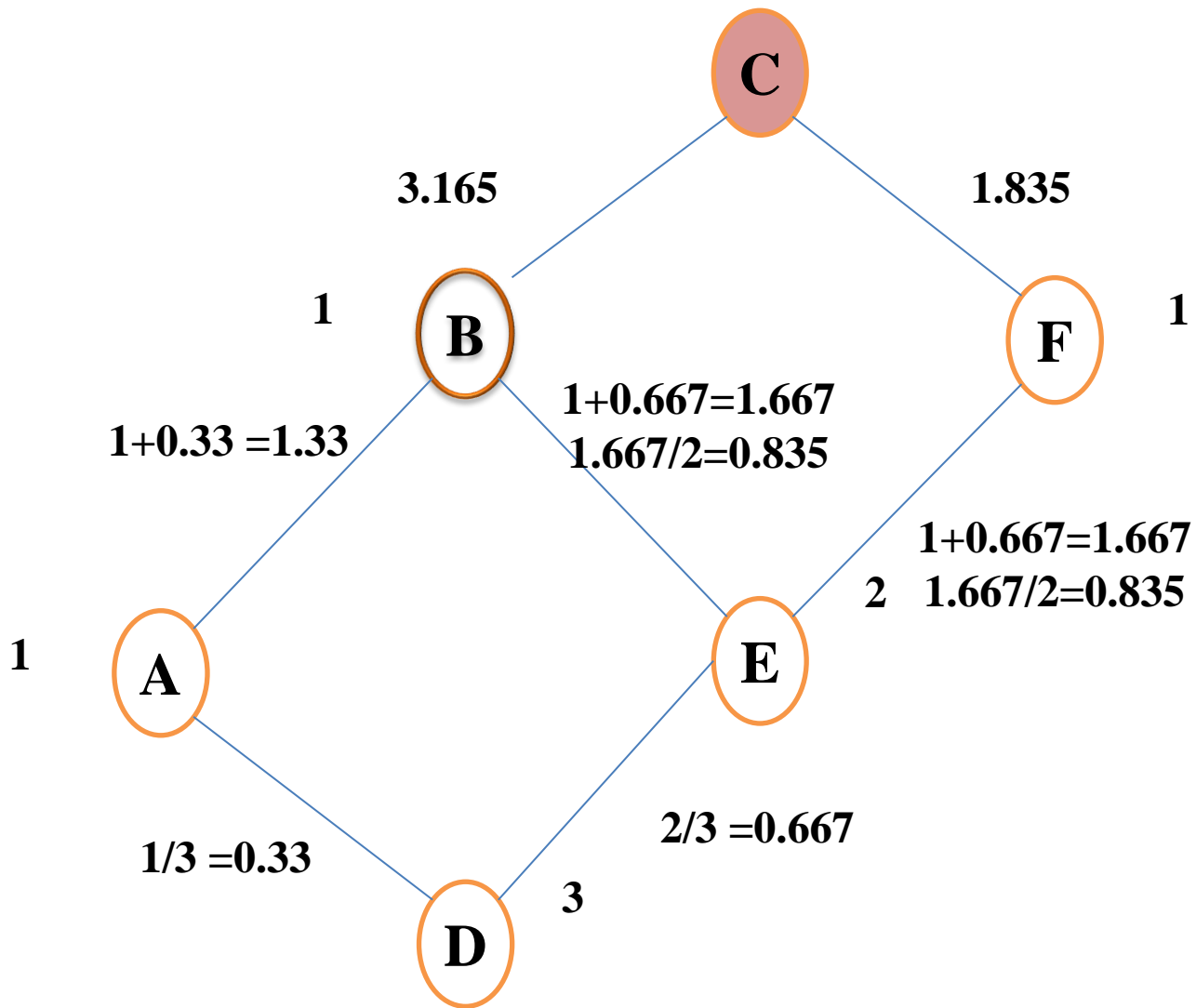


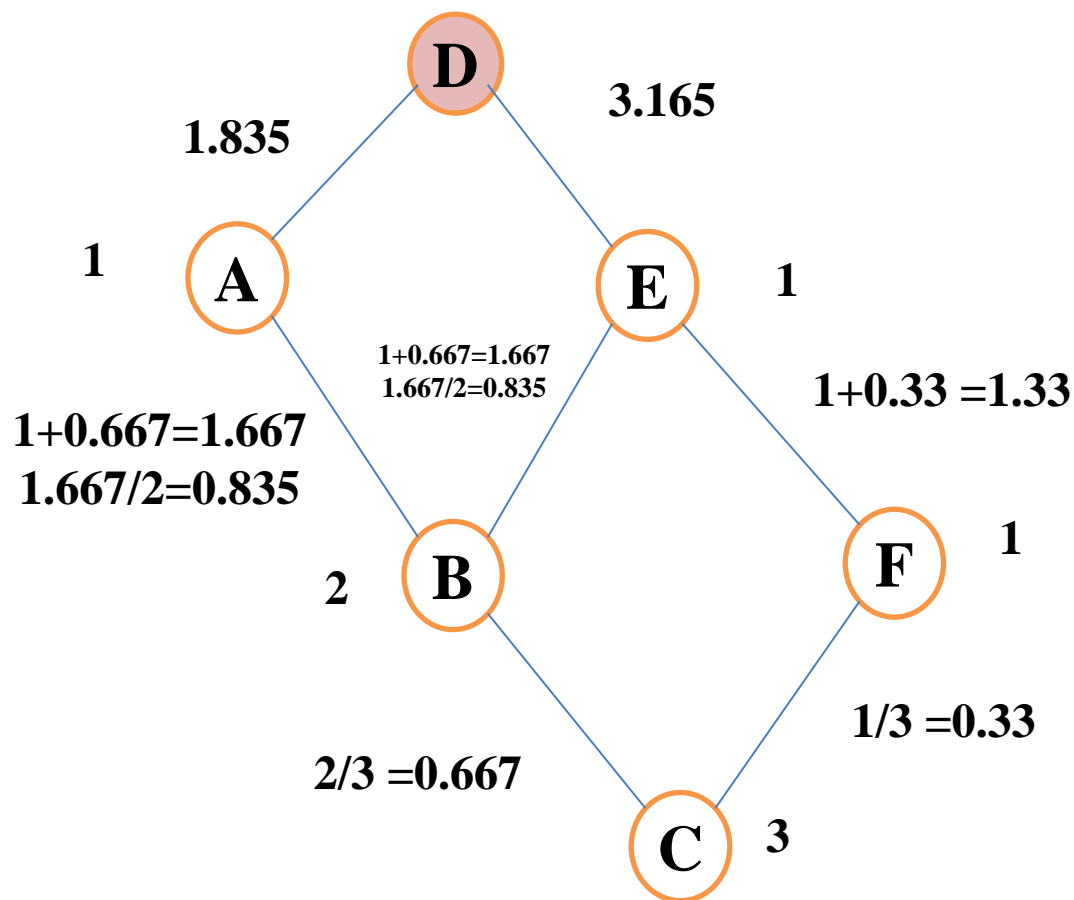
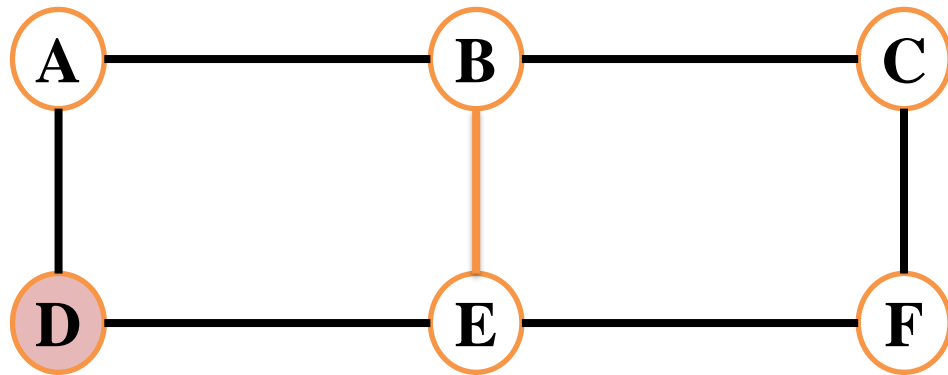


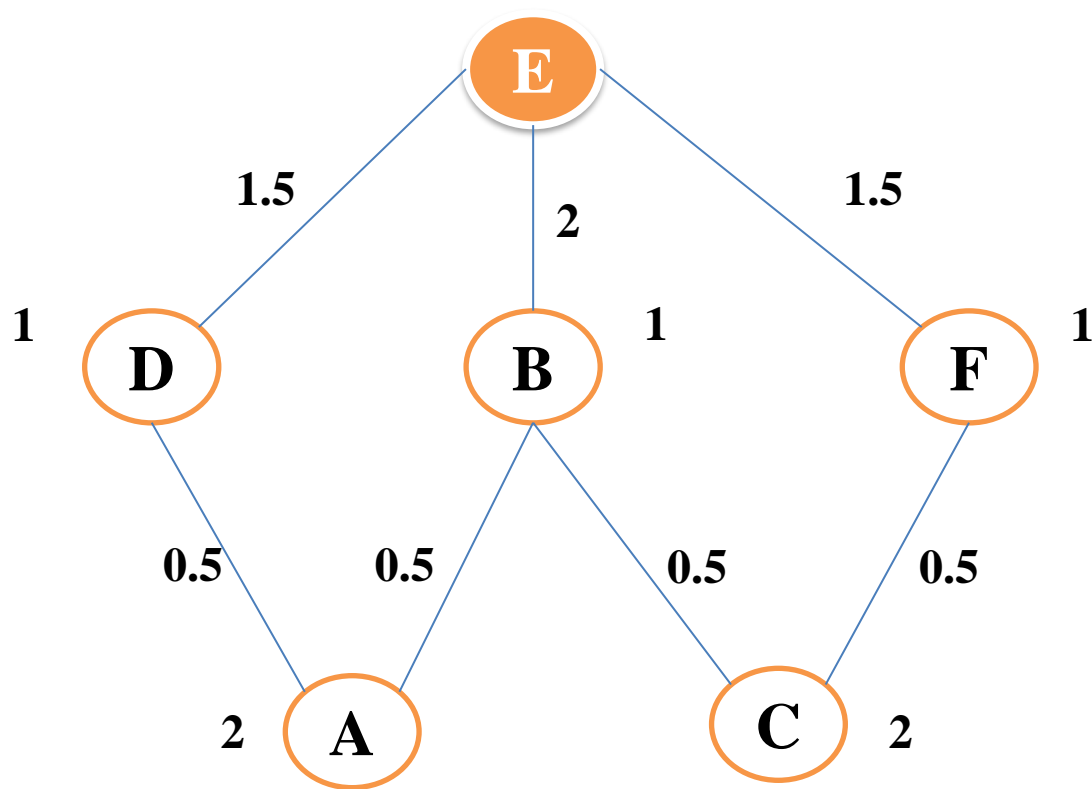
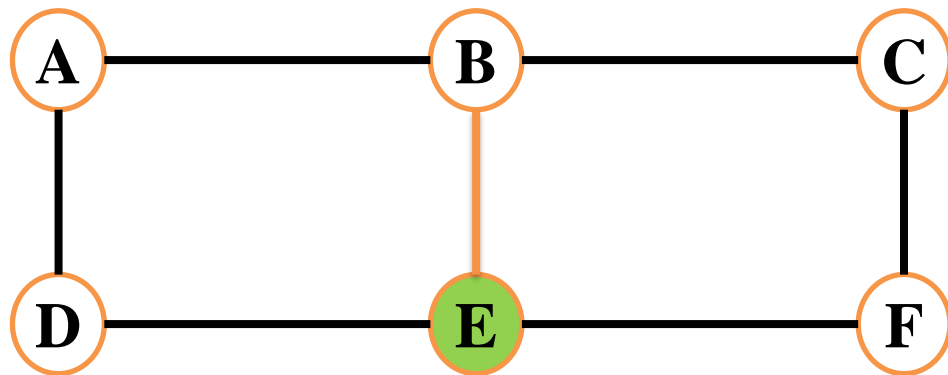


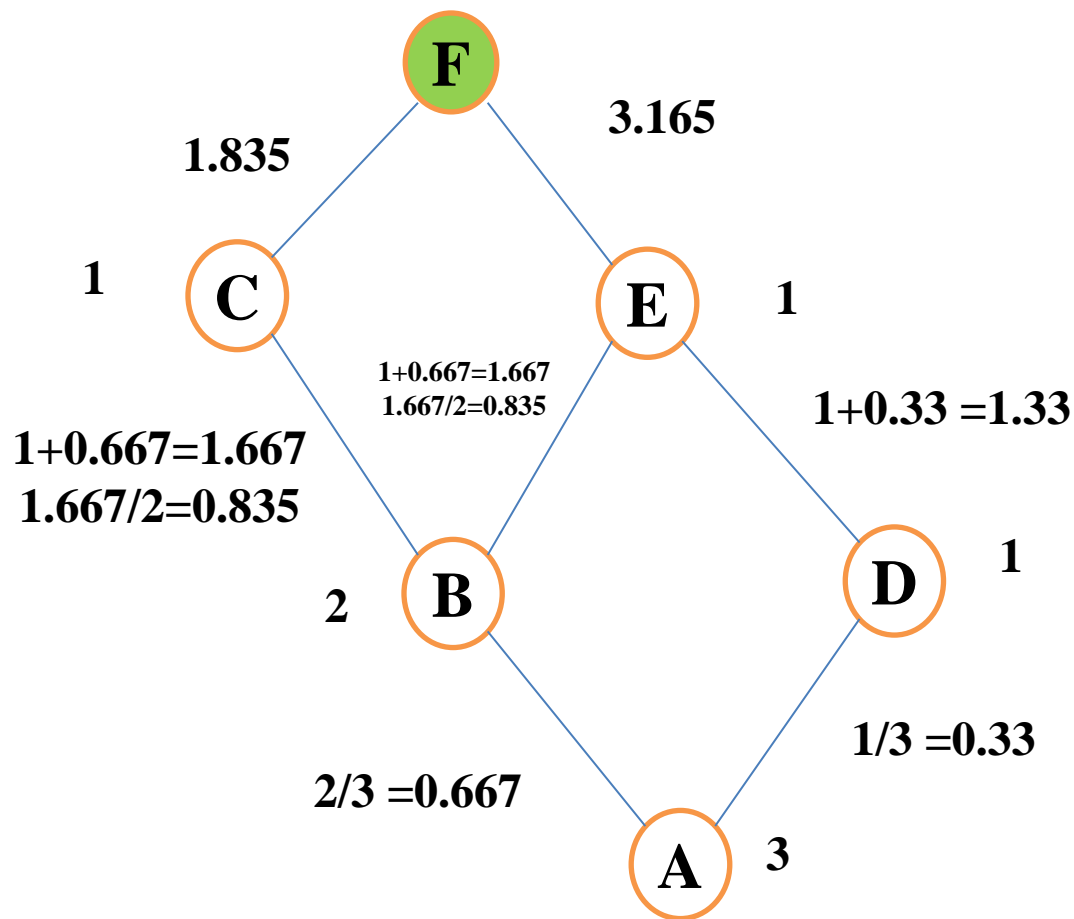
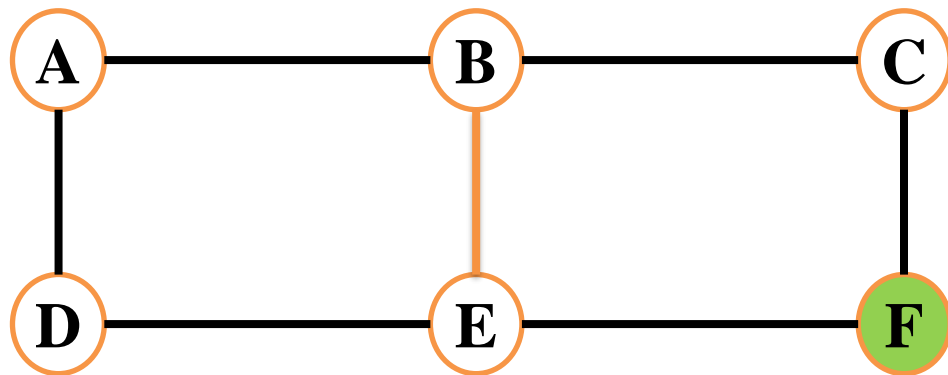


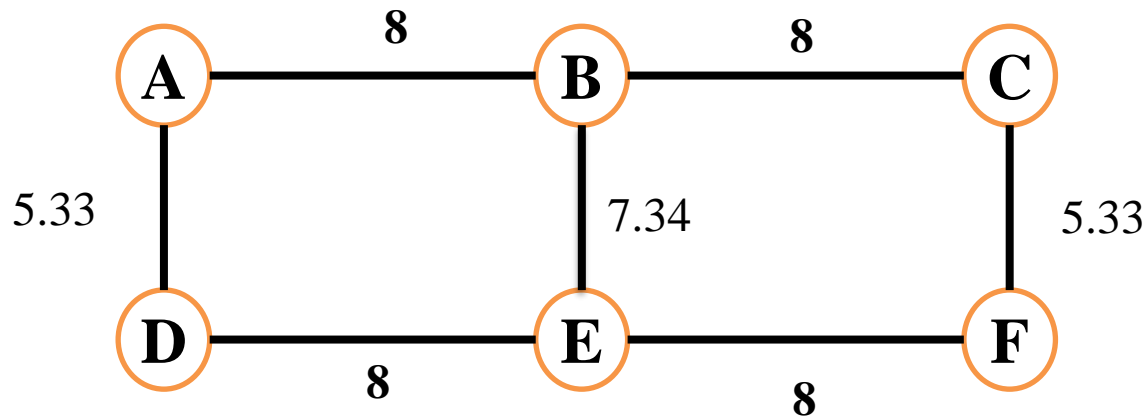






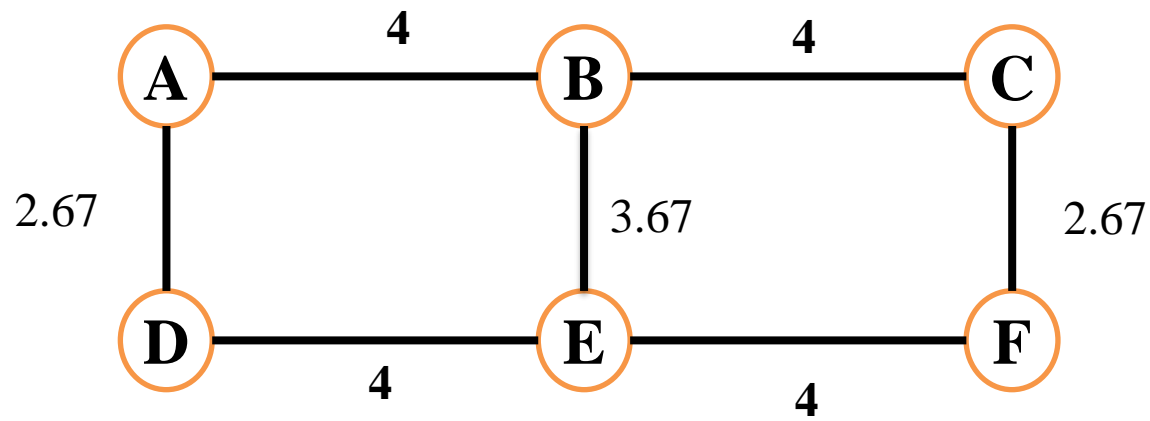
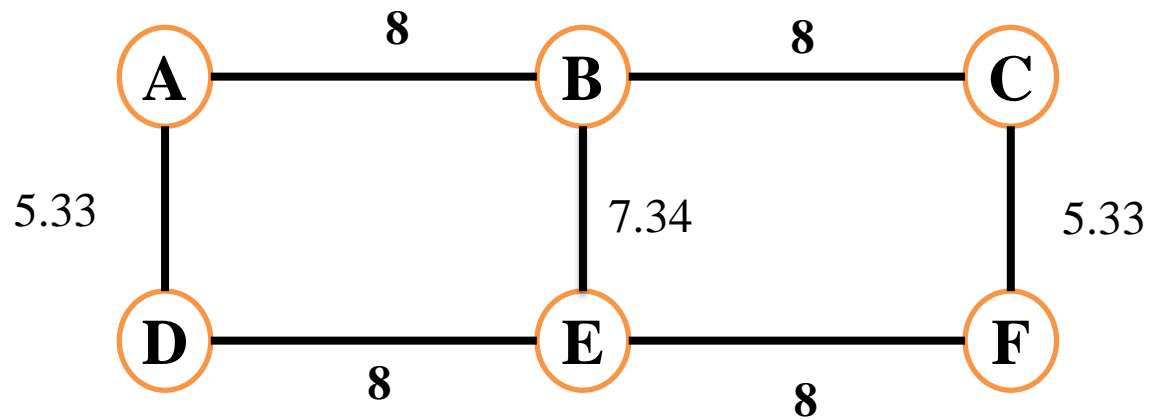


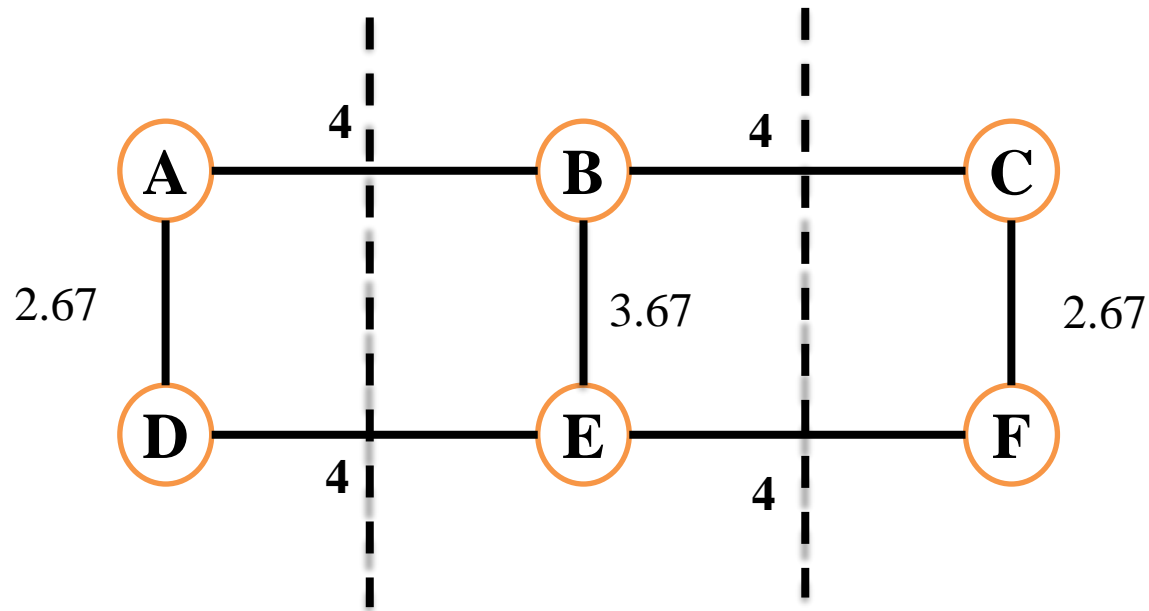




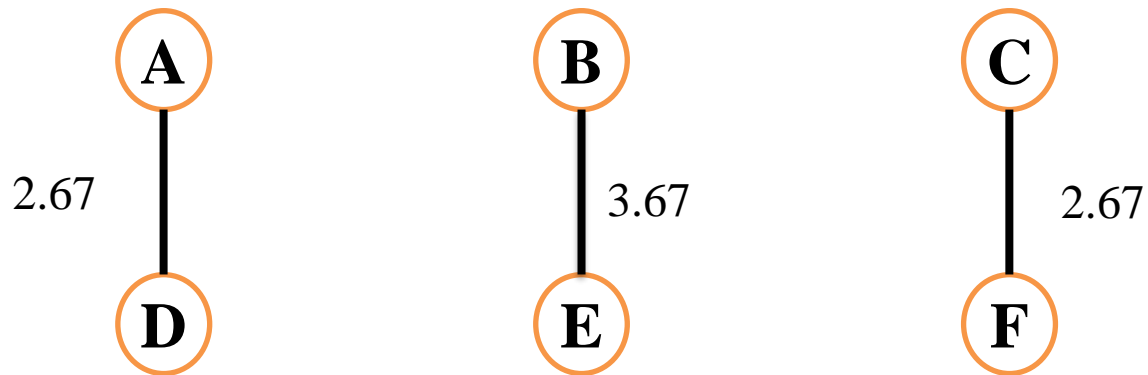
EDGE S	EDGE BETWEENNESS
AB	$3.165+1.5+1.33+0.835+0.5+0.667=8$
AD	$1.835+0.5+0.33+1.835+0.5+0.33=5.33$
BC	$3.165+1.5+1.33+0.835+0.5+0.667=8$
BE	$0.835+2+0.835+0.835+2+0.835=7.34$
CF	$1.835+0.5+0.33+1.835+0.5+0.33=5.33$
DE	$3.165+1.5+1.33+0.835+0.5+0.667=8$
EF	$3.165+1.5+1.33+0.835+0.5+0.667=8$







Deleted due highest edges weight



There are 3 communities.

**Thank You**