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Experiment No.6

Aim:

Implementation of Ford Fulkerson Algorithm.

Problem Statement:

Application of Ford-Fulkerson Algorithm to Maximum-Flow in Water Distribution Pipeline Network.
(DOI: 10.29322/IJSRP.8.12.2018.p8441)
http://dx.doi.org/10.29322/IJSRP.8.12.2018.p8441

Objective:

- Understanding Max-Flow Problem and Ford-Fulkerson Algorithm.
- Implement class Graph.
- Implement BFS (Breadth First Search) function to detect existence of path from source to sink.
- Implement FordFulkerson function to calculate max-flow in the given network.

Methodology:

I. Given a graph which represents a flow network where every edge has a capacity. Also given two vertices source 's' and sink 't' in the graph, we find the maximum possible flow from s to t with following constraints:
    i. Flow on an edge doesn't exceed the given capacity of the edge.
    ii. Incoming flow is equal to outgoing flow for every vertex except s and t.

II. Ford-Fulkerson Algorithm:
The following is simple idea of Ford-Fulkerson algorithm:
    i. Start with initial flow as 0.
    ii. While there is an Augmenting path from source to sink:
        1. Add this path-flow to flow.
    iii. Return flow.

III. **Time Complexity** : O(max_flow * E).

Implementation:

- The Experiment is implemented using ***Python3*** programming language (version ***3.7.3***) on Windows-10 platform.
- We define a ***class Graph ,*** which we use to represent Directed graph in-terms of Cost Adjacency Matrix.
- We mainly implement two member functions under this class : ***FordFulkerson(self, source, sink)*** & ***BFS(self, s, t, parent)***.
- ***FordFulkerson*** function makes use of ***BFS*** to determine whether path exists between the ***source*** and ***sink***.

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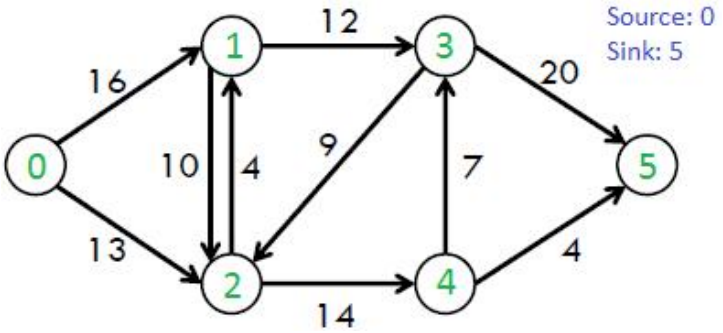
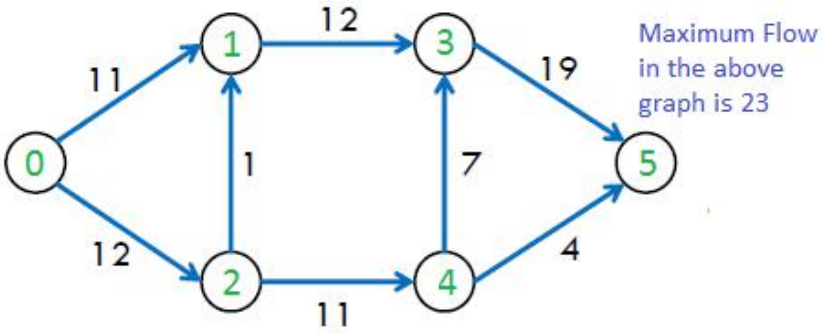
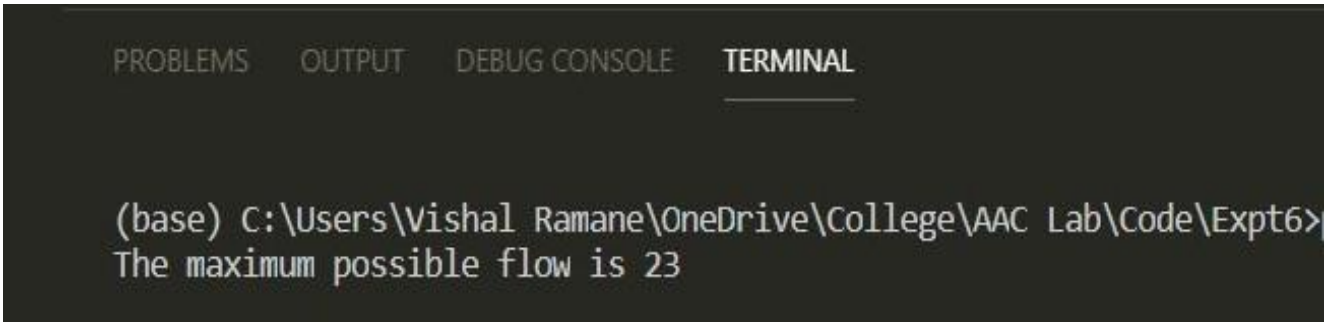
Results:





Output :



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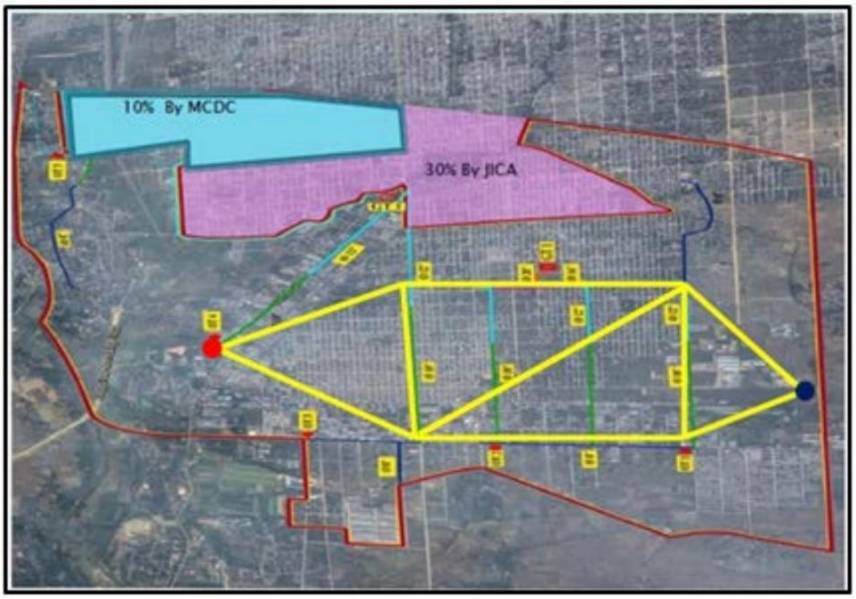
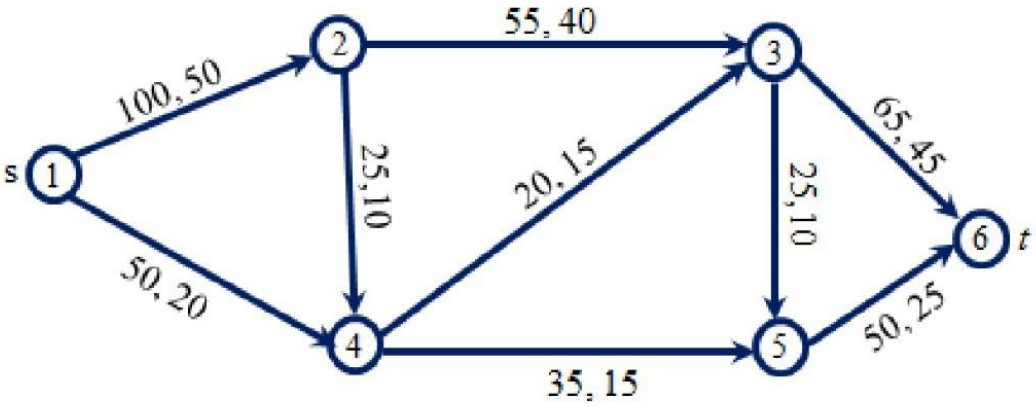


Fig. 2 Proposed network of water pipeline (yellow) in Pyigyitagon Township, Mandalay, Myanmar [9]

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PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

(base) C:\Users\Vishal Ramane\OneDrive\College\AAC Lab\Code\Expt6>
The maximum possible flow is 110
```

Conclusions:

Thus we have successfully implemented Ford Fulkerson algorithm to find maximum flow in water pipeline distribution network.