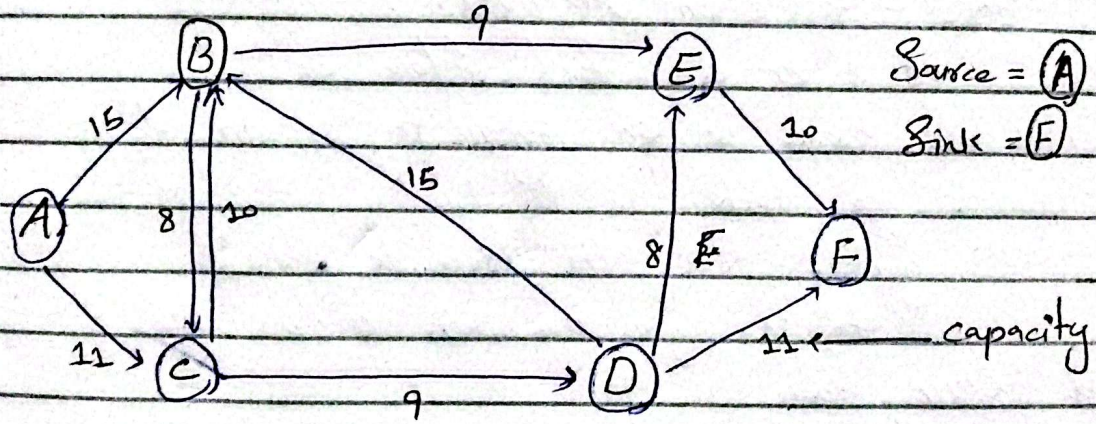
Ford Fulkerson Algorithm for Maximum Flow Problem

Problem

Given a graph which represents a flow network where every edge has a capacity. Also given two vertices Source s and ~~from~~ and Sink ~~t~~ t in the graph. Find out the maximum possible flow from s to t with following constraints:

(a) Flow on an edge doesn't exceed the given capacity of the edge

(b) In flow is equal to outflow for every vertex except s and t.



Termilogies Used in Algorithm

* Residual Graph:- It's graph which indicates additional possible flow. If there is such Path from Source to Sink then there is a Possibility to add flow.

* Residual Capacity:- It's original capacity of the edge minus flow.

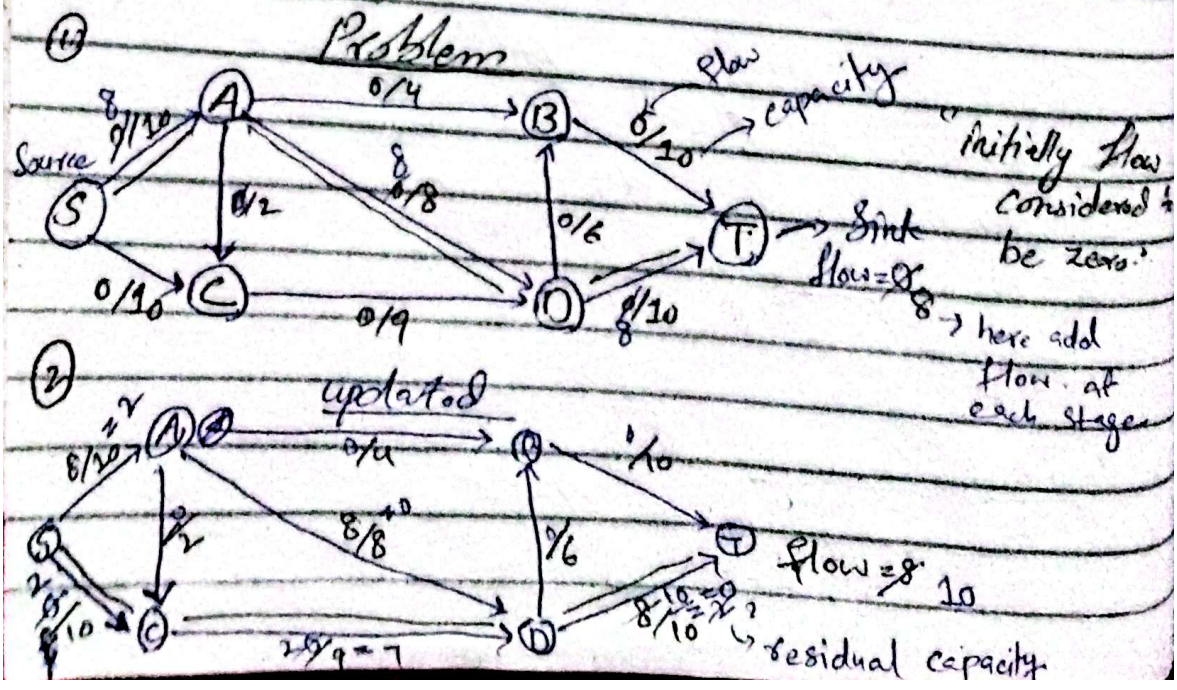
11 - 9 = 2 → Residual capacity

* Minimal cut:- Also known as a bottle neck capacity which decides maximum possible flow from source to sink through an augmented path.

* Augmenting paths:- Augmenting path can be done in two ways
  1. Non-full forward edges
  2. Non-empty backward edges.

A → C → D → F { Augmenting path.

Algorithm Solve steps
Ford - Fulkerson Algorithm
1. Start with a initial flow as "0"
2. While there is an augmenting path from source to sink.
   "Add the path flow to flow"
   ↳ until no augmenting path remains from S to t
3. Return flow.



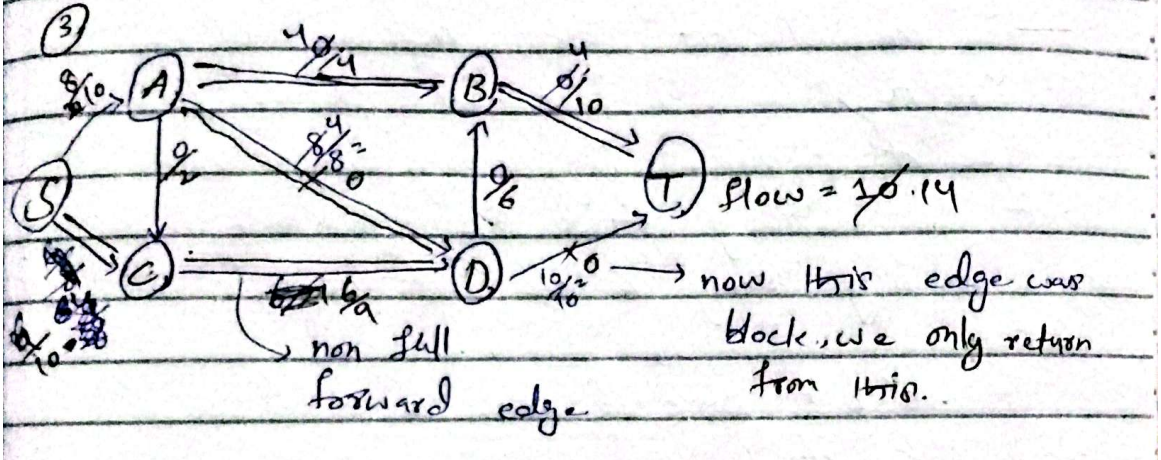
↑ → augmenting path
→ → actual path.

↑ counts this capacity by comparing residual capacity

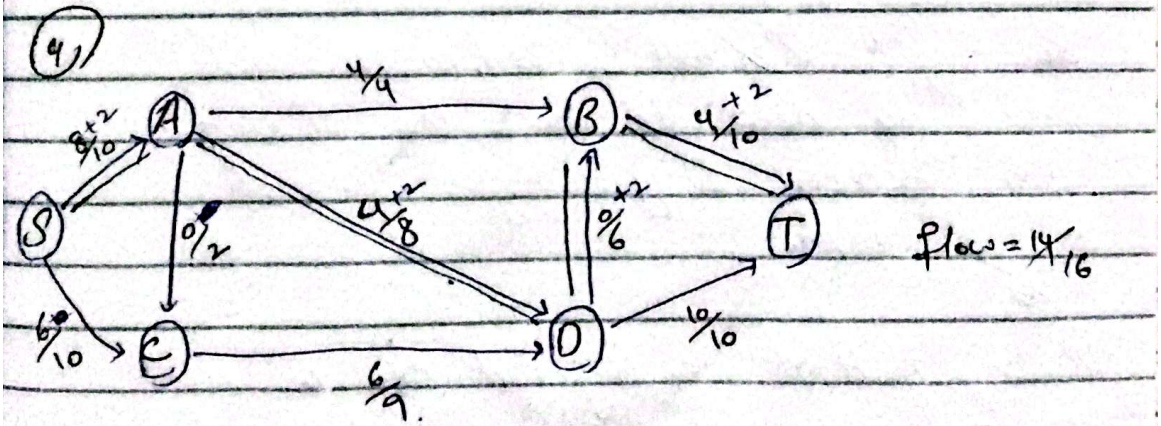
Augmenting Paths	Bottle neck capacity
① S → A → D → T	8
② S → C → D → T	2
③ S → C → D → A → B → T	4
④ S → A → D → B → T	2
⑤ S → C → D → B → T	+ 3
	19.

b

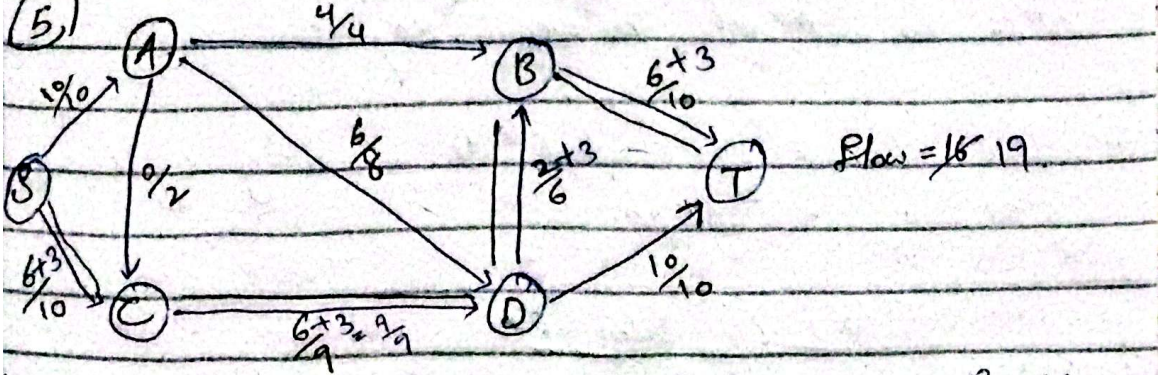
③



④



⑤



There is no another augmenting path possible so the maximum flow is [19].

* The residual graph, with its backward edges, is what makes the Ford-Fulkerson algorithm robust and guarantees that it will find the true maximum flow.