# SNS COLLEGE OF TECHNOLOGY

**Coimbatore-35**
**An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## DEPARTMENT OF INFORMATION TECHNOLOGY

## 16IT302 – DESIGN AND ANALYSIS OF ALGORITHMS

III YEAR V SEM

UNIT-IV-Iterative Improvement

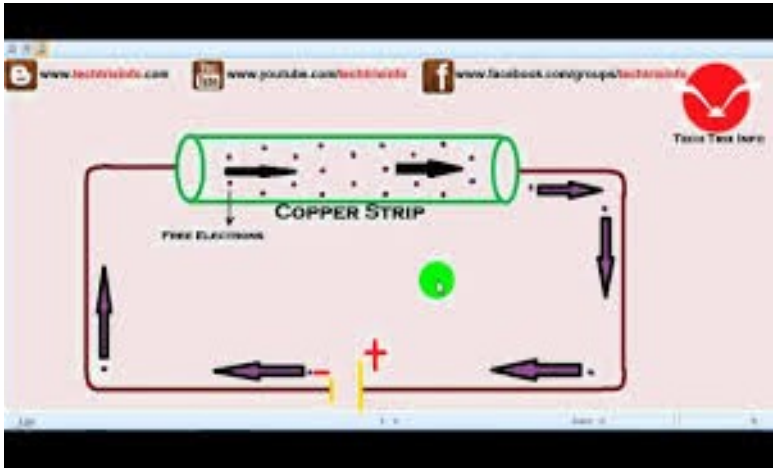
TOPIC: Maximum flow problem

Prepared by
S.Rajasulochana,AP/IT

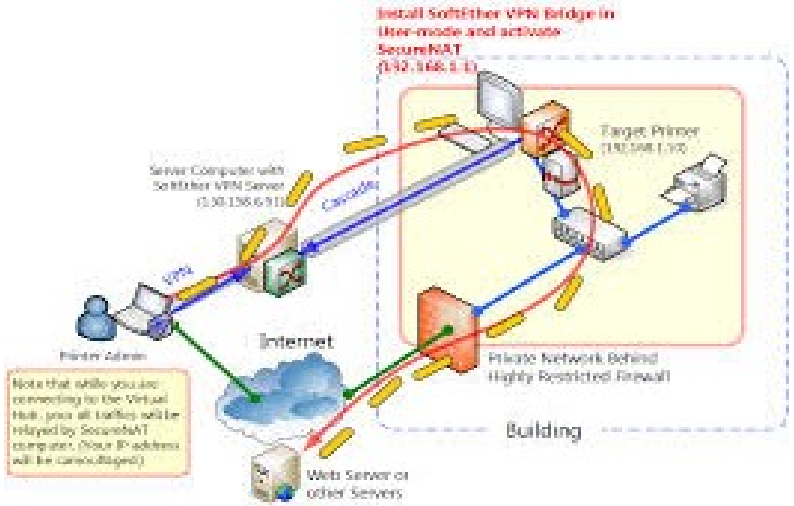
# Traffic in a Road System

# Fluids In Pipes

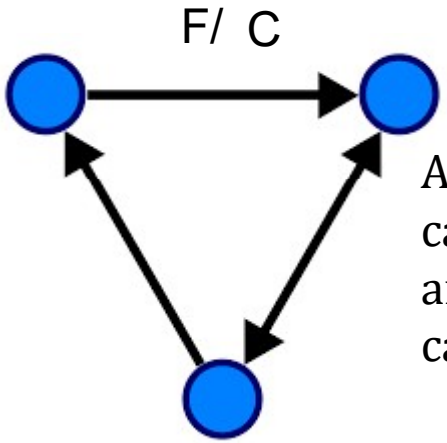
# Currents In An Electrical Circuit



# Packet Traffic in Computer Networks



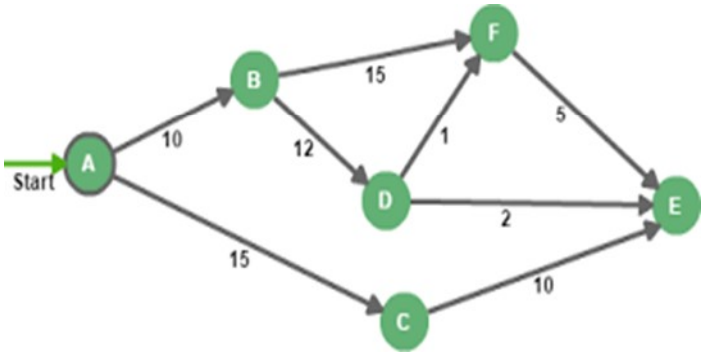
# Flow Network




A directed graph where each edge has a capacity and each edge receives a flow. The amount of flow on an edge cannot exceed the capacity of the edge

# Flow Network

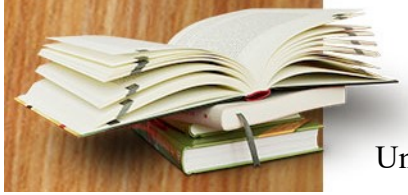
- A flow must satisfy the restriction that the amount of flow into a node equals the amount of flow out of it, unless it is a source, which has only outgoing flow, or sink, which has only incoming flow

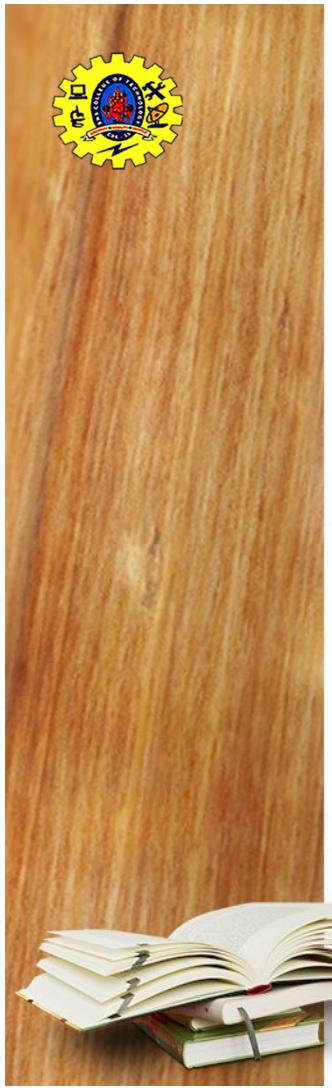



**Source :**Only one vertex no entering edge
**Destination:** One vertex with no leaving vertex
**Capacity:** Weight

# Max Flow Problem

- an optimization theory problem
- involves finding a feasible flow through a single-source, single-sink flow network that is maximum





# Ford Fulkerson Algorithm for Maximum flow problem

- Given a graph which represents a flow network where every edge has a capacity.
- Source ***s*** and Sink ***t***
- Find the maximum possible flow from *s* to *t* with following constraints
  1) Flow edge cannot exceed the given capacity of the edge
  2)Inflow is equal to out flow for every vertex except ***s*** and ***t***

# Algorithm

Step 1 : Start with a initial flow as 0

Step 2 : While there is an augmenting path from source to sink
add two paths flow to flow

Step 3 : Return flow

# Terminologies

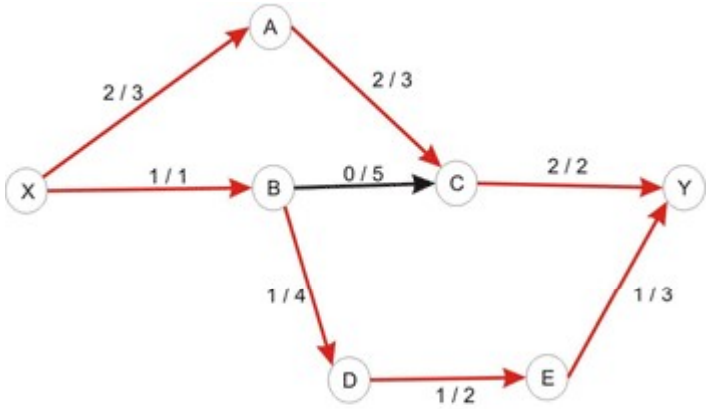



Figure 1a - Maximum Flow in a network

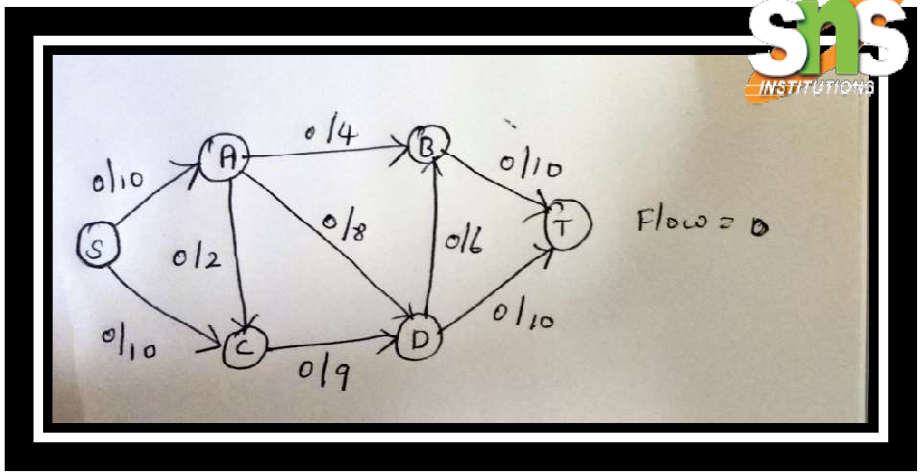
- **Residual Graph:** Adds Additional possible flow in graph
- **Residual Capacity:** Original capacity-Flow
- **Minimum Cut:** Maximum Possible flow

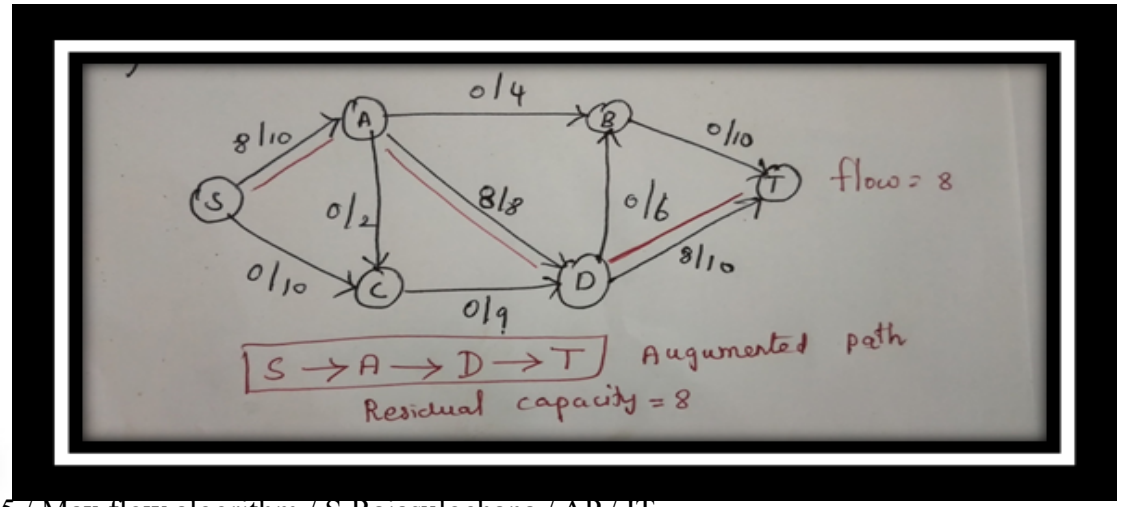
- **Augmented Path:**

1)Non full forward edges
2)Non empty backward edges

# Example

**Step : 0**

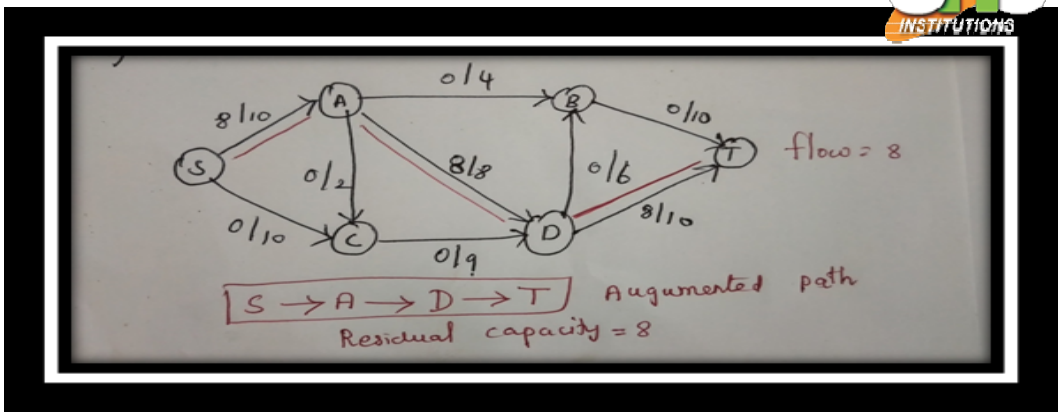


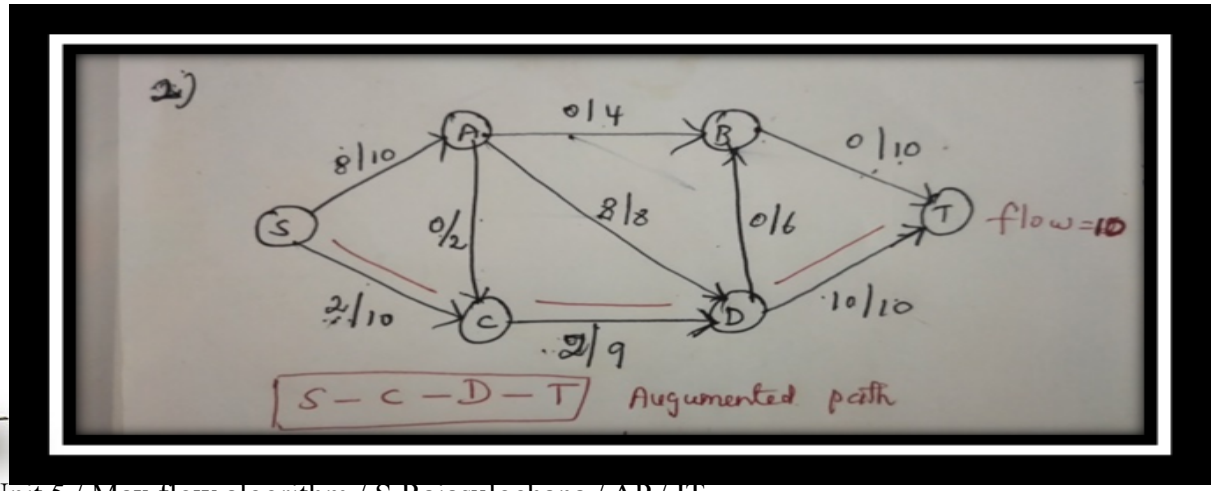




**Step : 1**

# Example

**Step : 1**

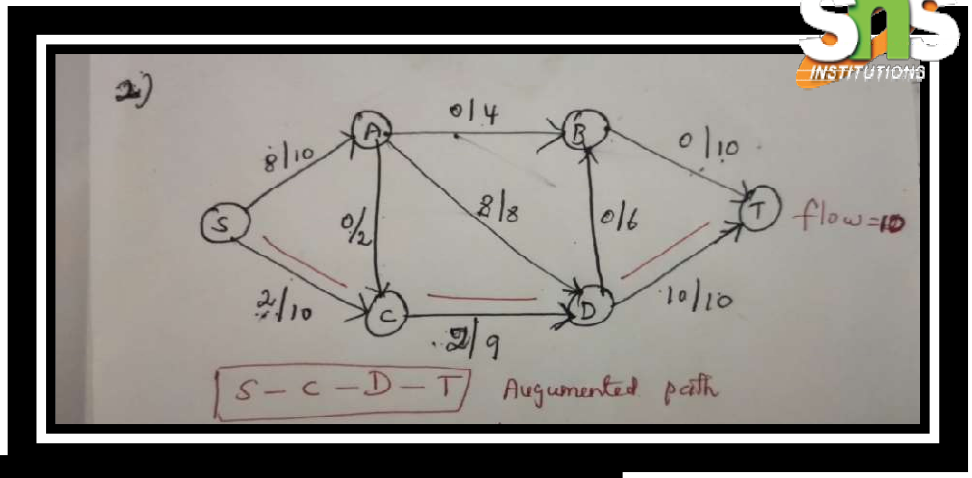


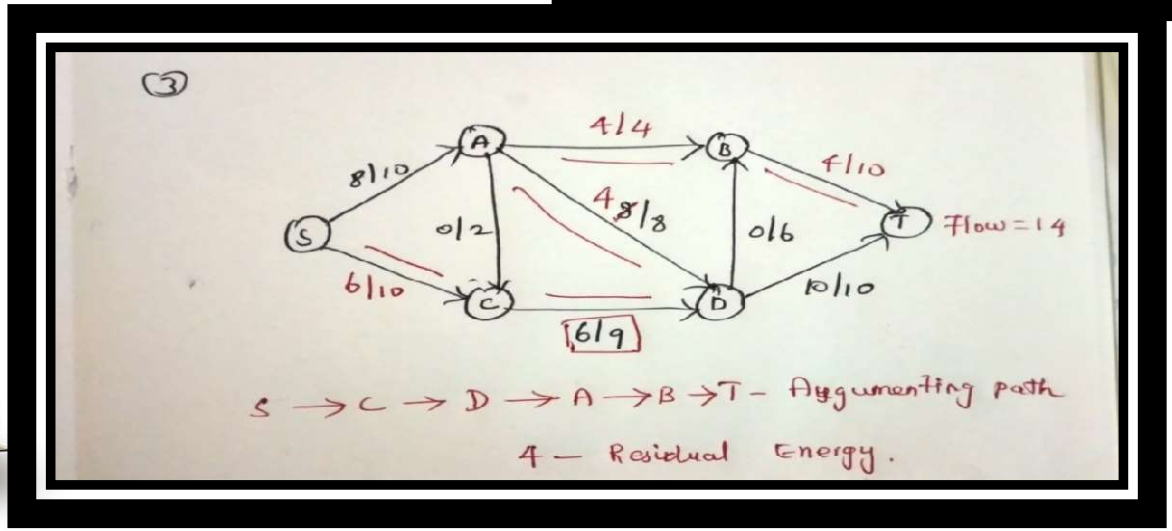

**Step : 2**

# Example

**Step : 2**

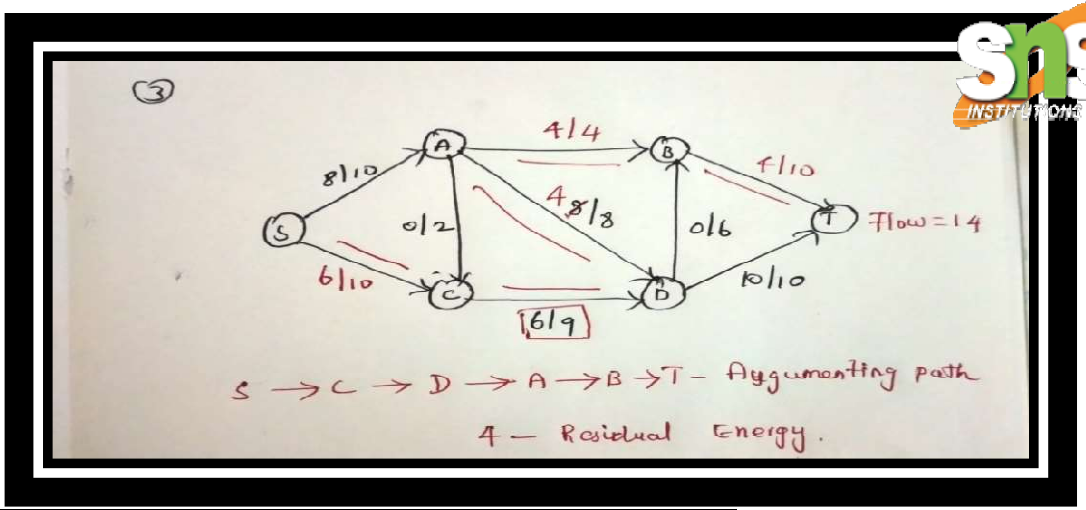



**Step : 3**

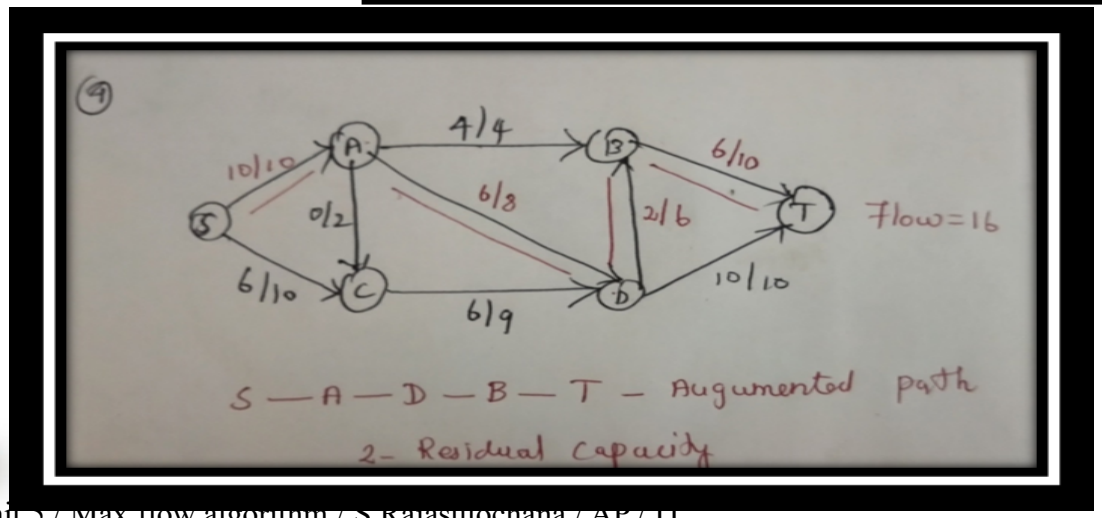


# Example

**Step : 3**

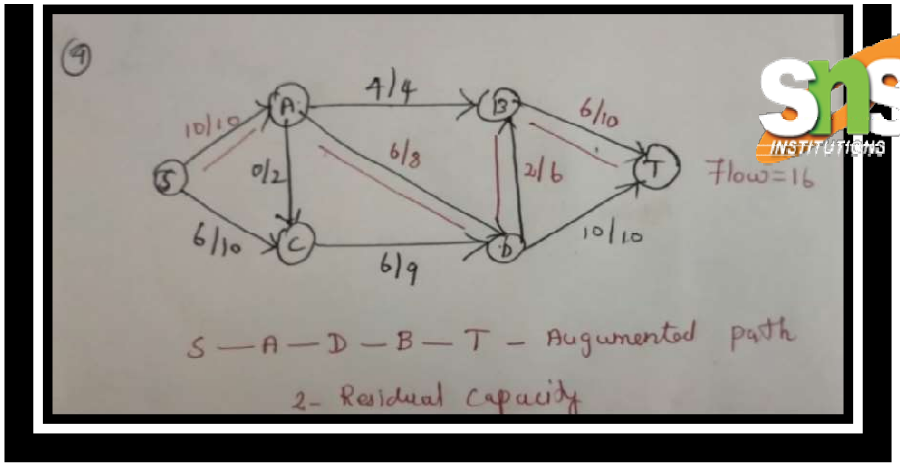



**Step : 4**

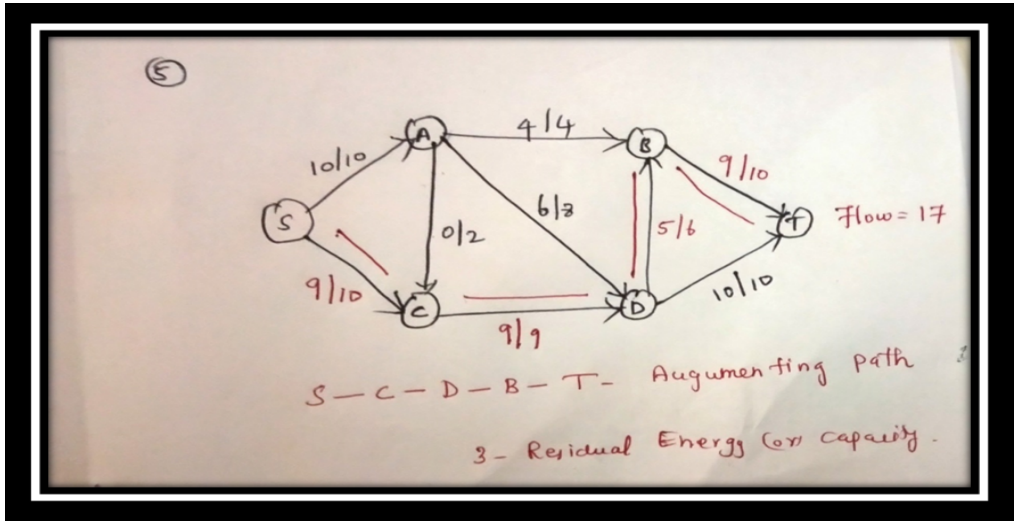


# Example

**Step : 4**

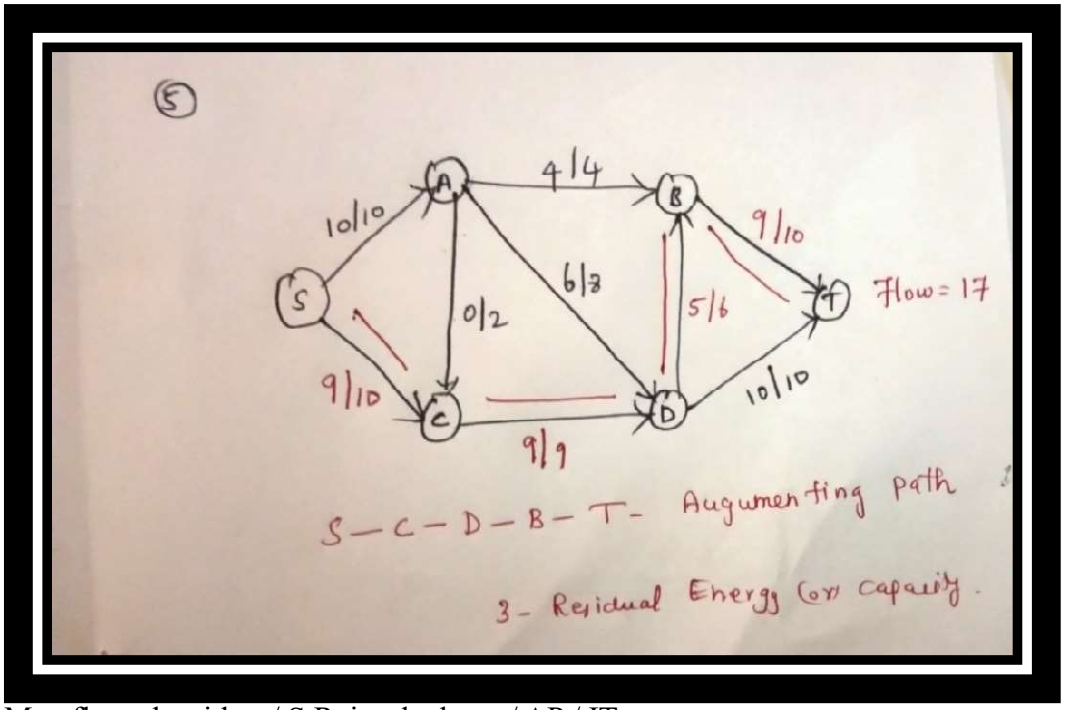



**Step : 5**



# Example

**Step : 5 flow=19**

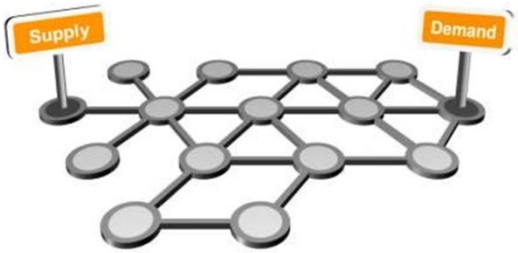


# Use in Computer Networks

- Technology Impact
- Modern Lifestyle
- Advancing Civilization
- Flourishing Networks

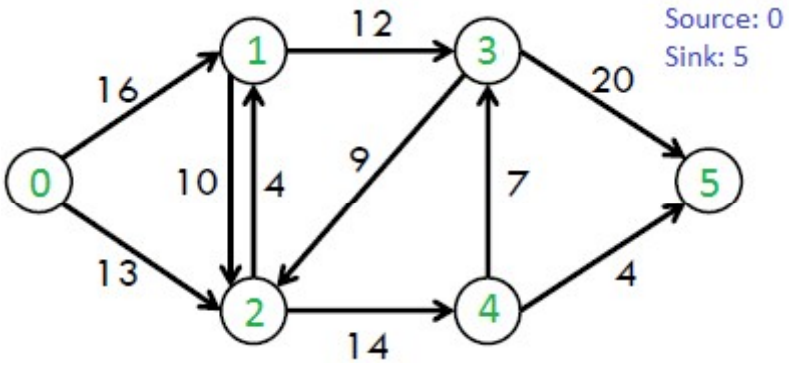
# Network Optimization


- Cost Vs Profit
- Supply Vs Demand
- Network Optimization




## Assessment

Find max flow using ford Fulkerson algorithm for a given graph



Thank you