

Edmonds-Karp Algorithm

Finds Maximum flow, by repeatedly finding the shortest augmenting paths in residual network graph.

Shortest augmenting path:

- Path with fewest number of arcs/edges
- Throughout the algorithm, the length of the shortest path never decreases.

Algorithm:

EDMONDS-KARP ALGORITHM(G, s, t)

begin

 initialise flow f to 0

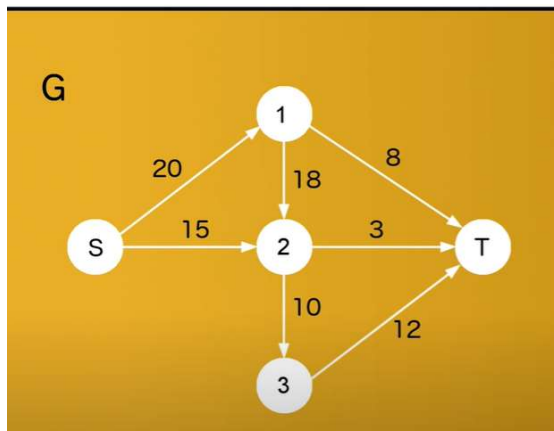
while there exists a shortest augmenting path p in
 the residual network G_f **do**
 augment flow f along p

end

end

Example:

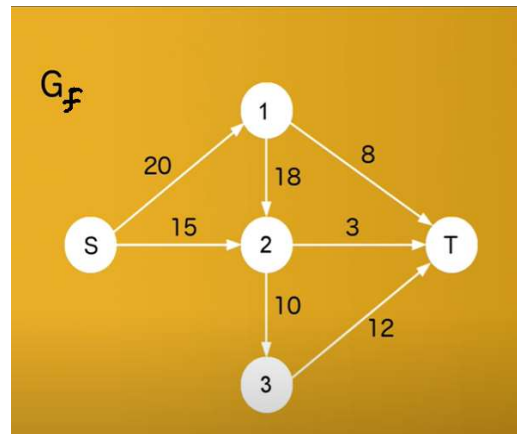
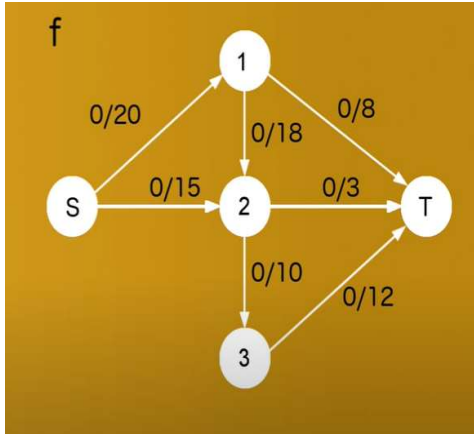
G – given graph



f - Flow Graph of given graph. Flow initialized with 0

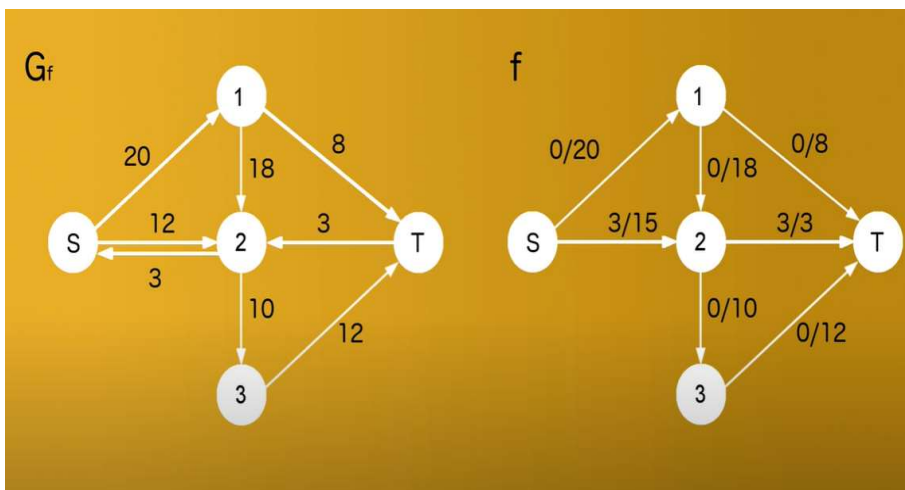
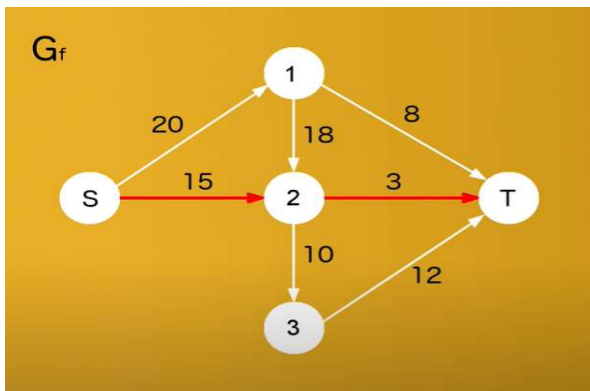
G_f – Corresponding residual Graph

Flow = 0



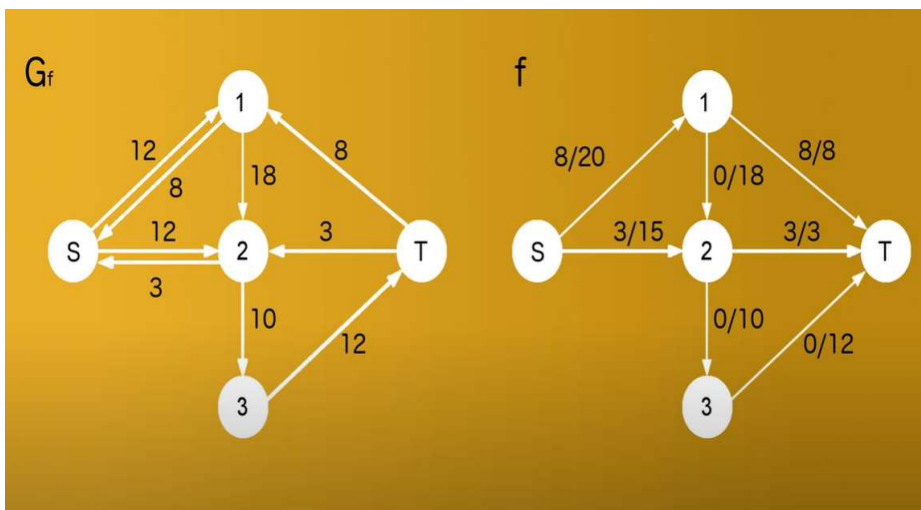
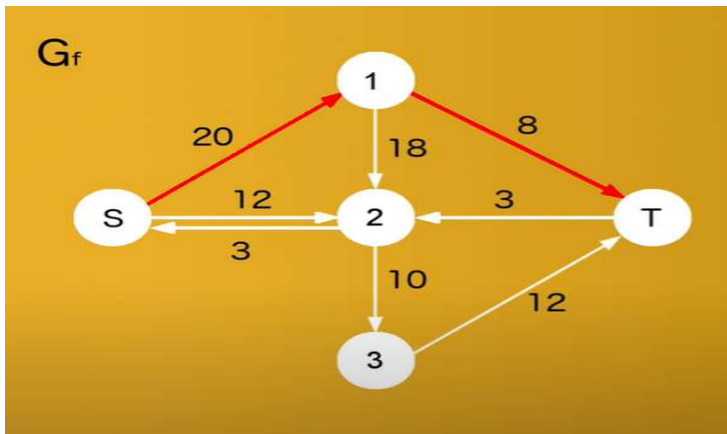
Shortest Augmenting path 1: S – 2 – T

Flow = 3



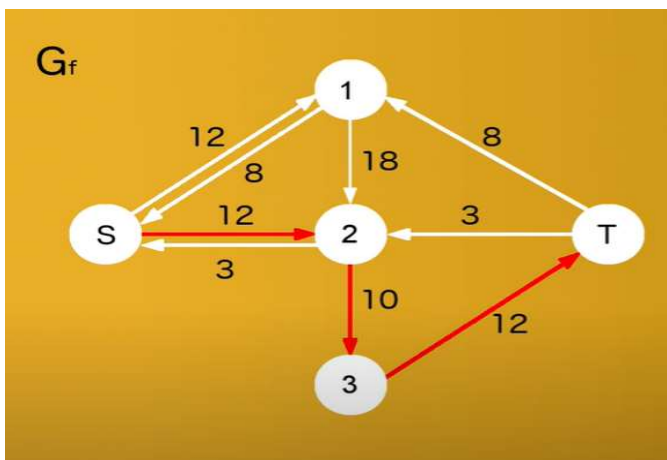
Shortest Augmenting path 2: S – 1– T

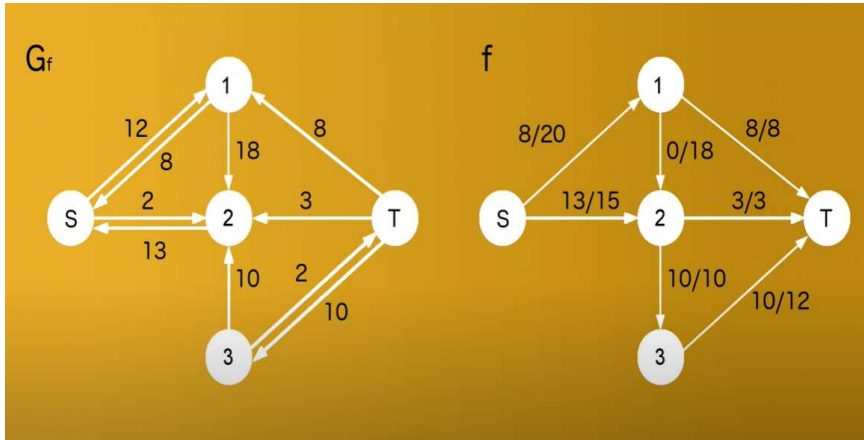
Flow = 8



Shortest Augmenting path 3: S – 2– 3 – T

Flow = 10





There are no more augmenting paths.

Algorithm Terminates.

Therefore, Max Flow = $3+8+10 = 21$

Time Complexity: Total running time of the Edmonds-Karp algorithm is $O(VE^2)$