The maximum flow problem:-

→ Maximum flow (→ rate) is a maximum feasible flow b/w source & sink.

The Ford - fulkerson method :-

Terminology.

→ Its an iterative method by using 3 method.

(i) Residual network

(ii) Augmenting path.

(iii) Cuts .

Residual Network. Graph.

→ Suppose we have flow Network $G=(V,E)$ with S and t. Let every edge u,v is having a pair flow/ capacity. then called Residual N/w.

$$\boxed{c_f(u,v) = c(u,v) - \underbrace{f(u,v)}_{\text{current flow}}}$$

Source → No Incoming Node and only Outward Node.

Sink → No Outward only inward Node.

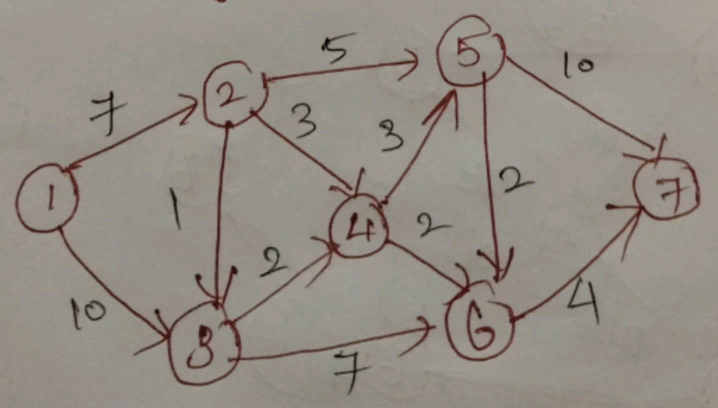
The given graph which represents the flow Network where every edge has capacity Also given two vertices S & T in the graph. Find out the maximum possible flow from s to t with following constraints

(i) Flow on an edge does not exit the given capacity of edge.

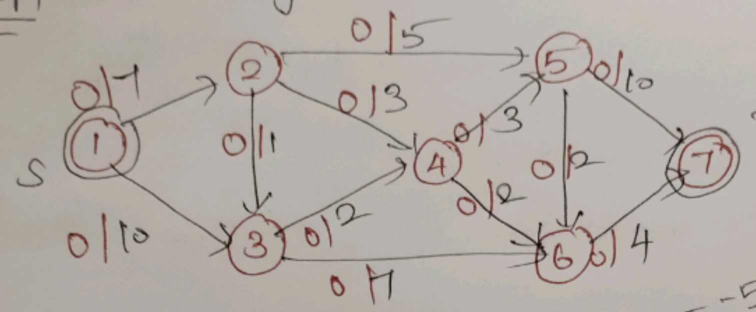
(ii) Inflow is equal to outflow for every vertex Except S & t.

Algorithm:-
Start ~~with~~ a initial flow.

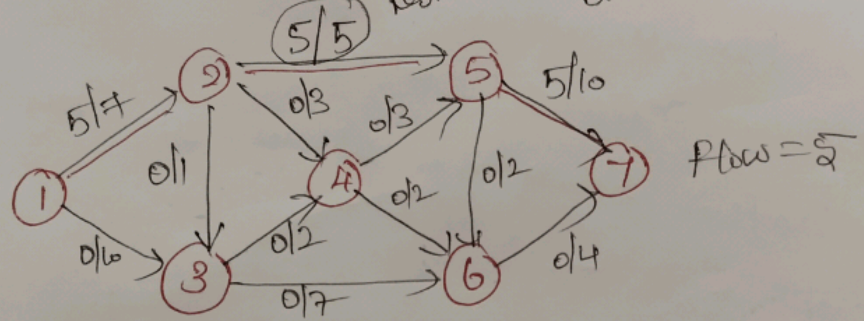
~~Bot~~ Find the maximum flow through the given Network using ford Fulkerson algorithm.



step1 initial graph.



step choose path Residual graph 5-5 0
Block it.

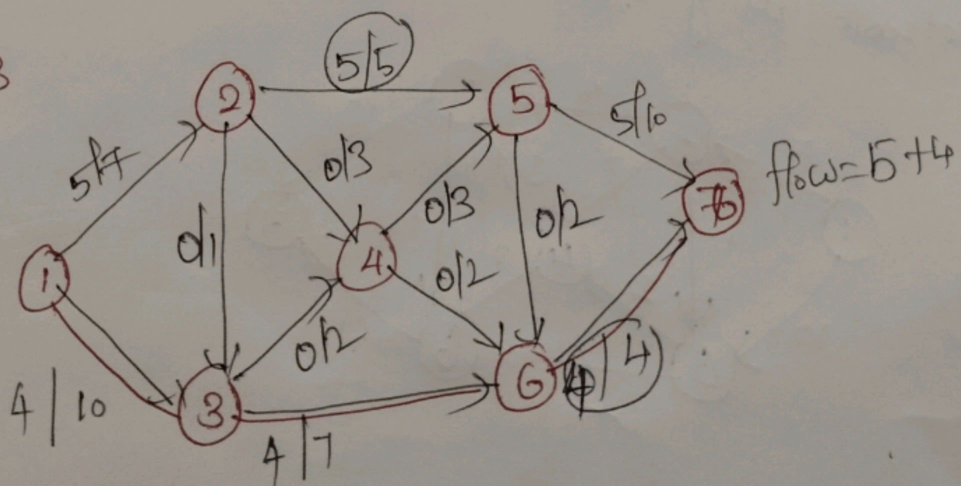


Augment path | Bottle neck capacity.

1-2-5-7 5

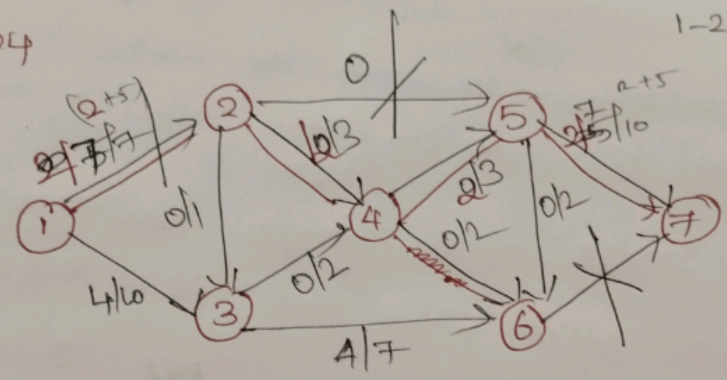
1→3-6-7 4

step3



Step4

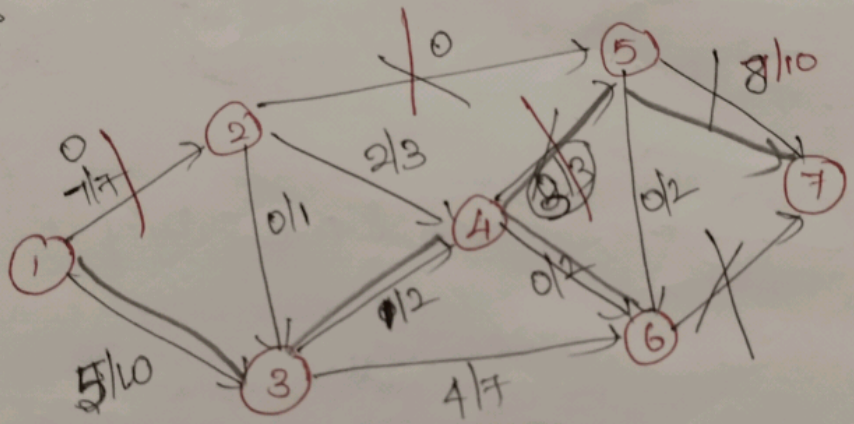
1-2-4-5-7 = 2



flow 5+4+2

1-3-4-5-7 = 1

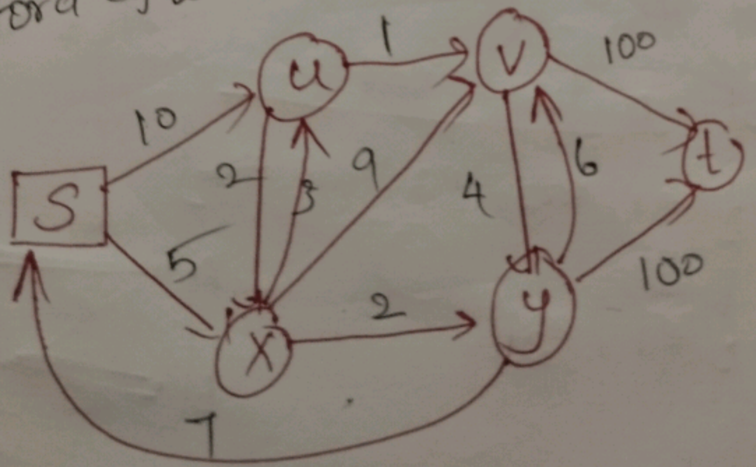
Step5



flow : 5+4+2+1

maximum flow through the given N/w using Ford-fulkerson method is $\boxed{5+4+2+1 = 12}$

Ex2



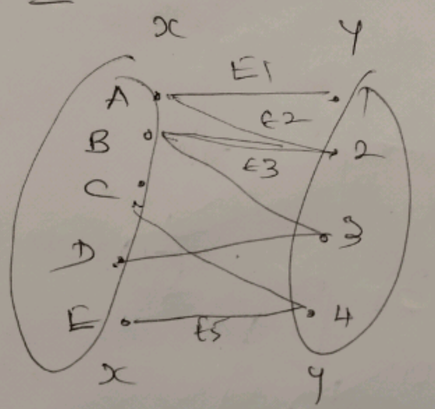
3+5=8

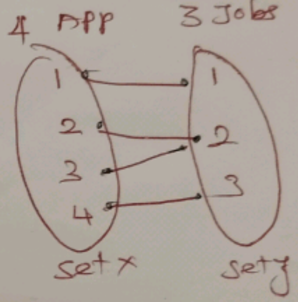
Maximum matching Bipartite graph :.

→ Graph G(V, E), in which the vertex set V is divided into 2 ~~distingue~~ disjoint sets X & Y.

→ Every edge of the graph has one end point in X and other end. point in Y

Ex





$V = \{A, B, C, D, E \,/\, 1, 2, 3, 4\}$ (A, B, C, D, E: X; 1, 2, 3, 4: Y)

$x \cup y = \{V\}$

$x \cap y =$ Null.

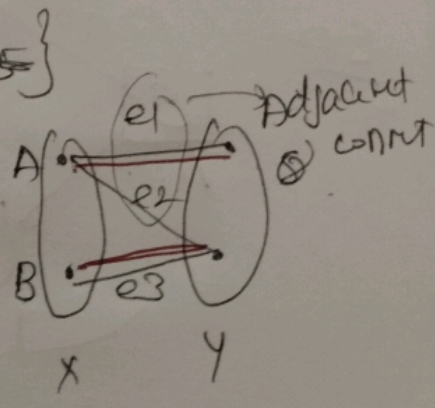
✗ Vertices of the same set are not connected

Matching :- (M)

→ Matching in a graph is a subsets of edge that no two edges share a vertex

ex $E = \{e1, e2, e3, \} \cancel{e4, e5}\}$

$M = \{e1, e2\}$



Two Colorable graph

→ A graph that can be Colored only with 2 Colors

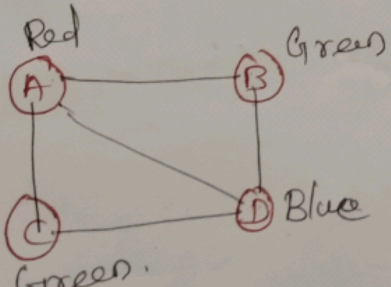
→ No two edges Connects the same colors.

→ Biportite Graph is a 2 color graph.

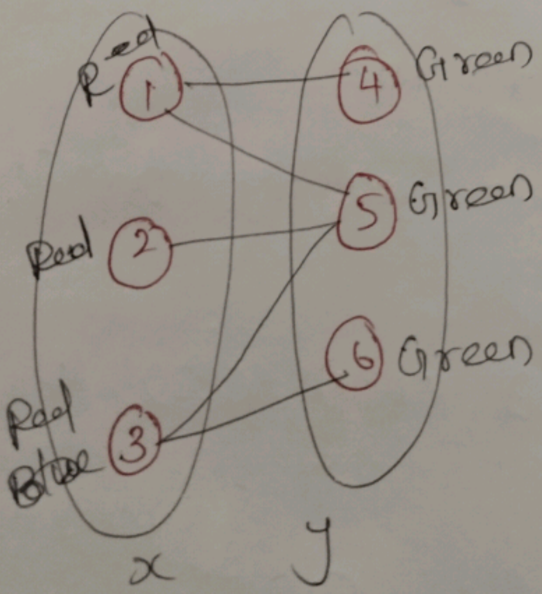
Graph coloring:-

→ No 2 adjacent states will be of same Color.

Ex



→ minimum color.



only 2 two color

x y

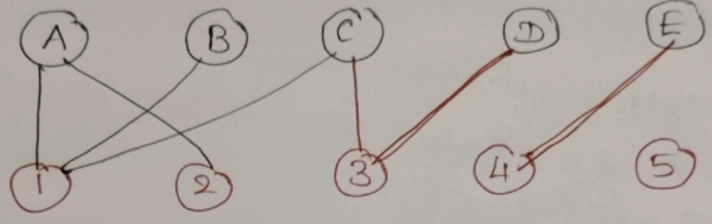
Rule 1 → color → X

1 → color → Y.

Problem

Maxim matching problem.

Ex1 Let M be the matching in bipartite graph G.



$M_a = \{ (D,3), (E,4) \}$

Soln

Find free vertex

$x = \{A, B, C, D, E)$

$y = \{1, 2, 3, 4, 5\}$

Consider vertex a; Mb:

Thus the maximum matching for the Bipartite graph is

$M = \{ (A,2), (B,1), (C,3), (D,5), E,4) \}$.