Bellman Ford Algo (1)

→ Single ~~Sho~~ Source Shortest Path

→ works well for -ve edge.

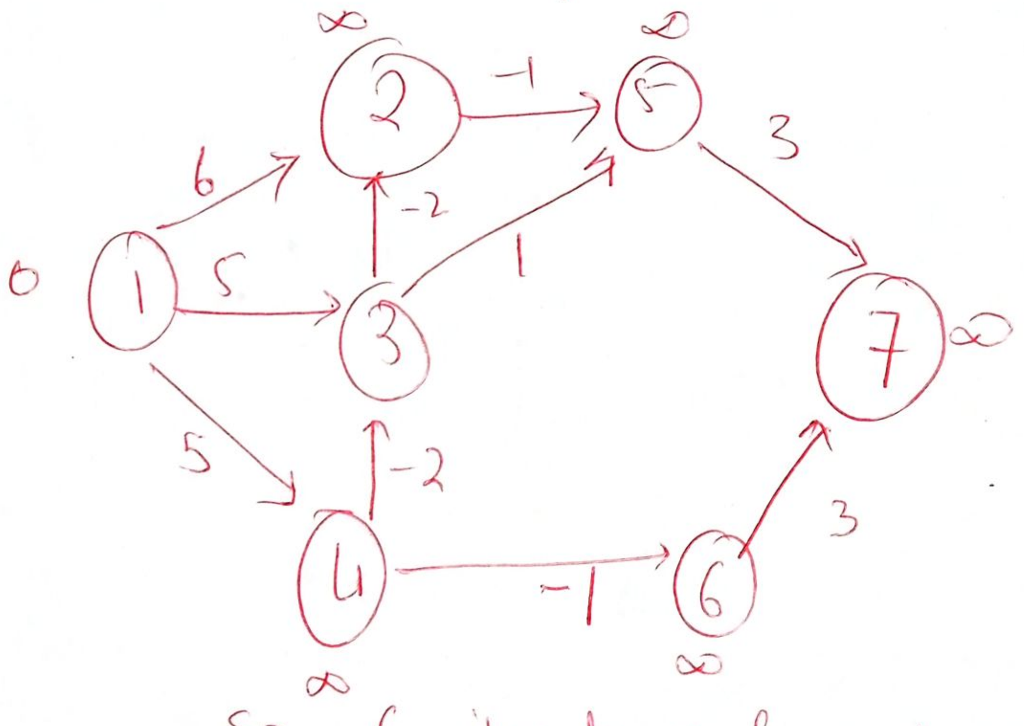
→ An application of dynamic programming

1) ~~Pick~~ Check all possible solution

2) Pick the best one

→ works for directed / undirected with non negative weight

Relax the vertices for V-1 times



so 6 iterations for relaxation

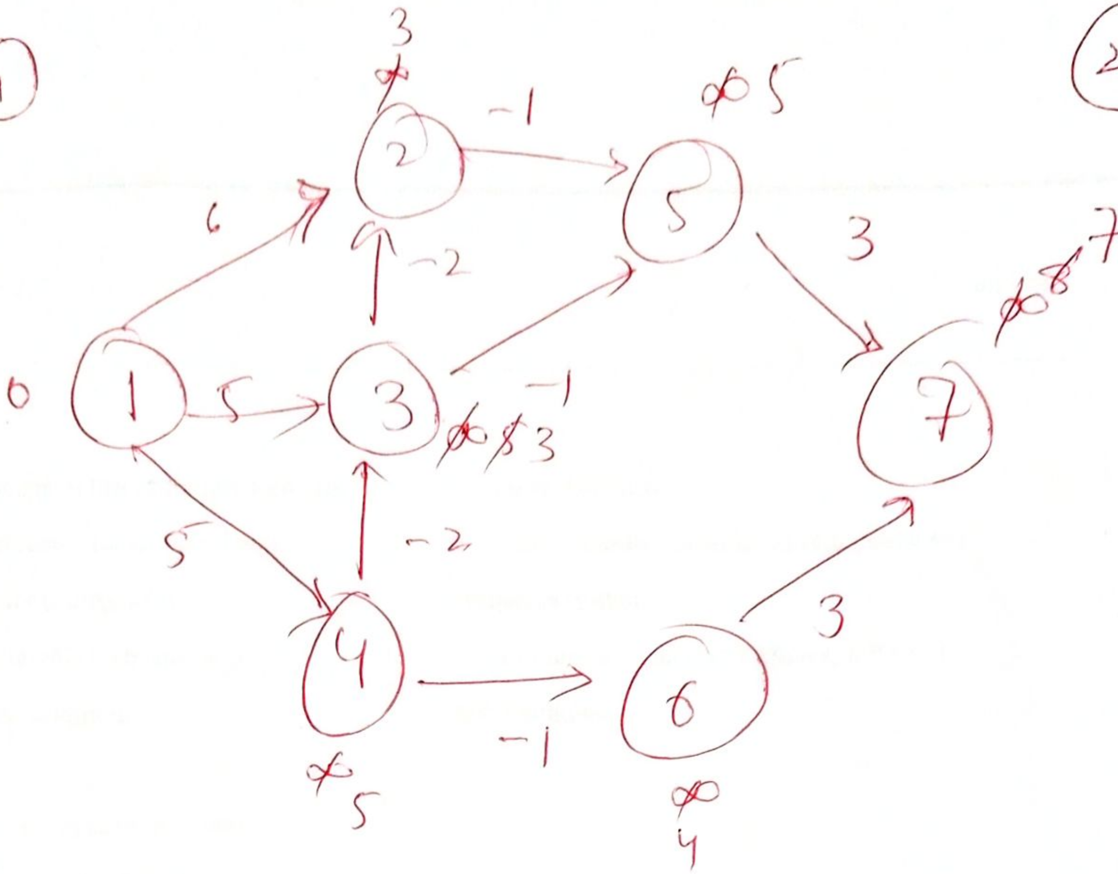
edge list

(1,2) (1,3) (1,4) (2,5) (3,2) (3,5)

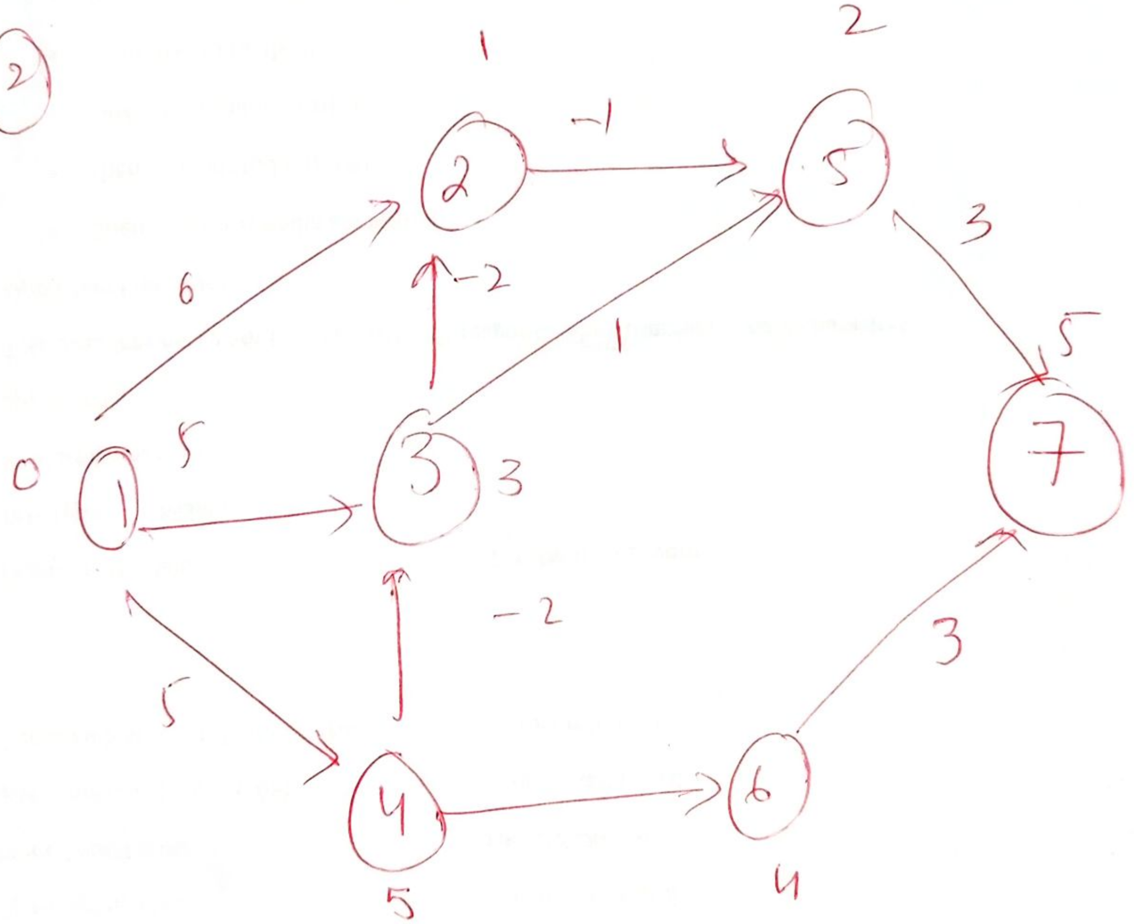
(4,3) (4,6) (5,7) (6,7)

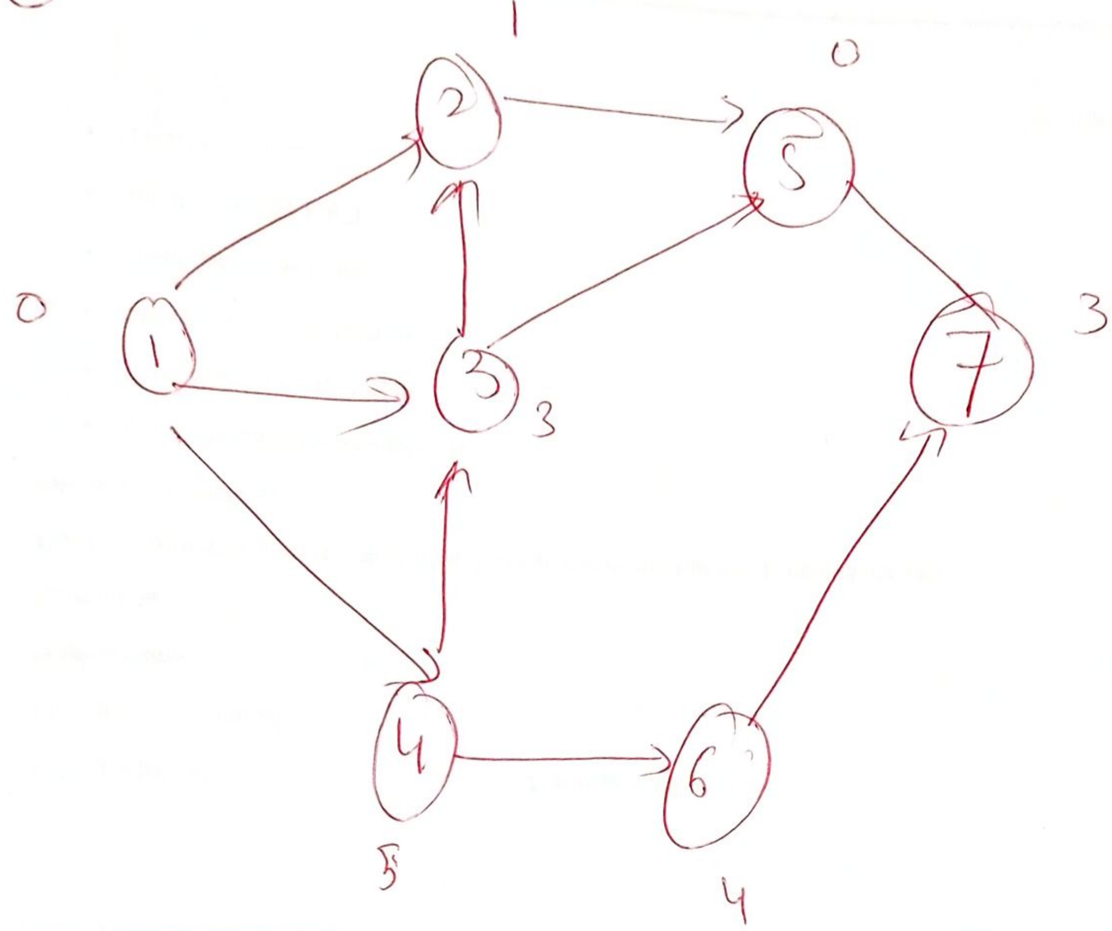
1

2



2





$\boxed{4, 5, 6}$ will remain same

1	0
2	1
3	3
4	5
5	0
6	4
7	3

$E(V-1)$

$|E||V|$

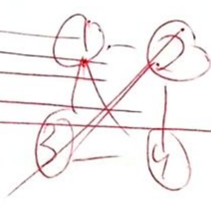
$= n^2$

If there is a complete graph

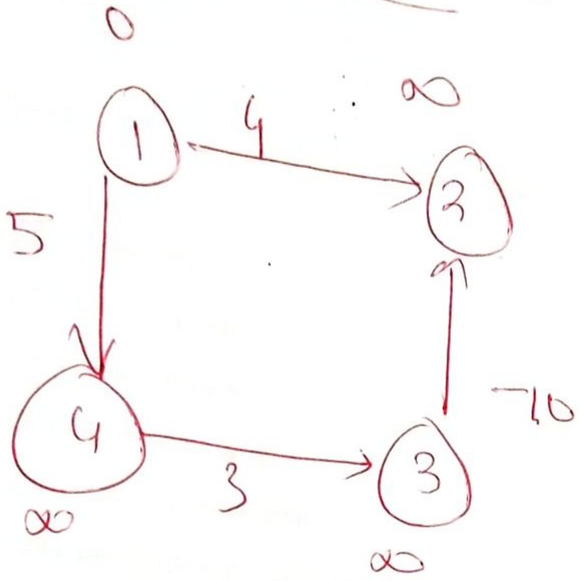
$$\left[\frac{n(n-1)}{2}\right]\left[n-1\right] = O(n^3)$$

time

$$\cancel{\frac{4(4-1)}{2} = \frac{4(3)}{2} = \frac{12}{2}}$$

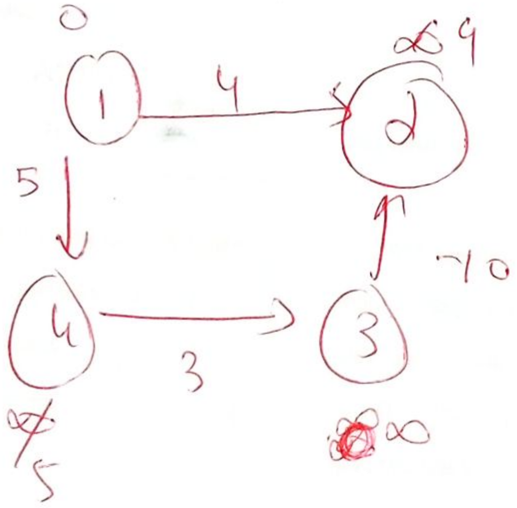


Another example

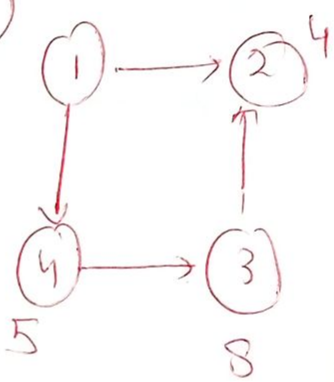


edge (3,2) (4,3) (1,4) (1,2)

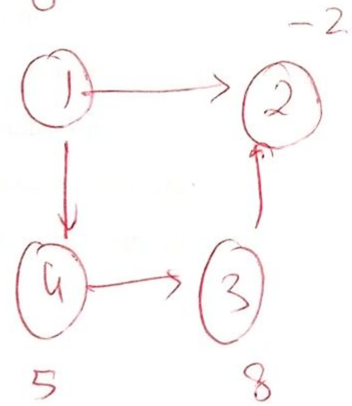
1



2



3



1 - 0

2 - -2

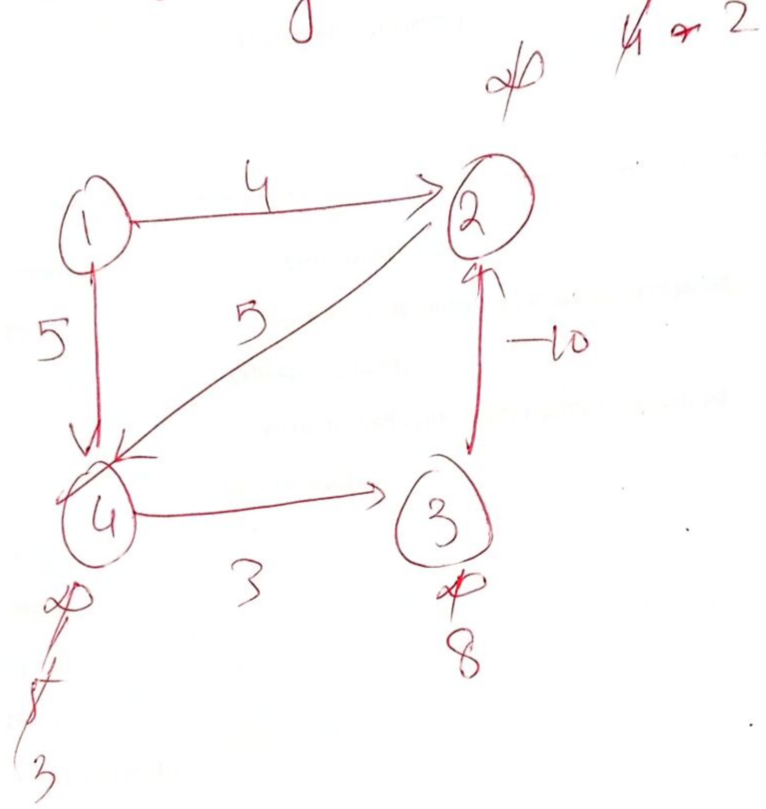
3 - 8

4 - 5

if relex one more time,

answer is same - - -

Now one change



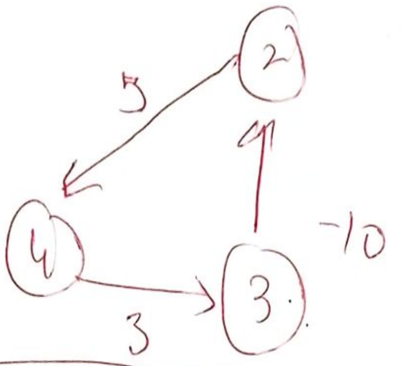
(3,2) (4,3)(1,4) (1,2) (2,4)

if we do another time

it will change. (releveel)

it should not happen.

⇒ It happens due to -ve ~~cycl~~ cycle



$5+3-10 = -2$

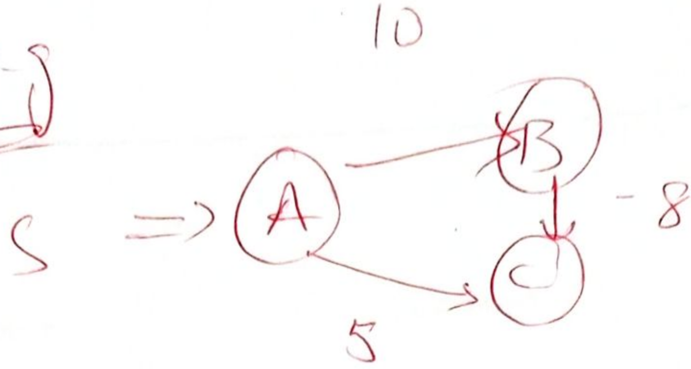
Answer cannot be freezed.

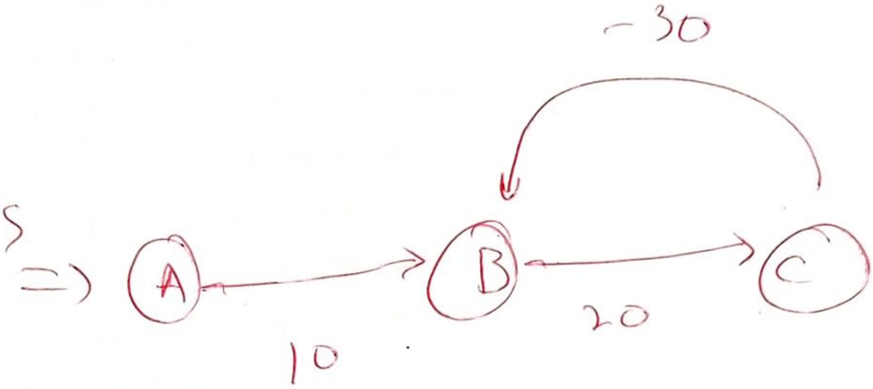
So bellmen ford fails.

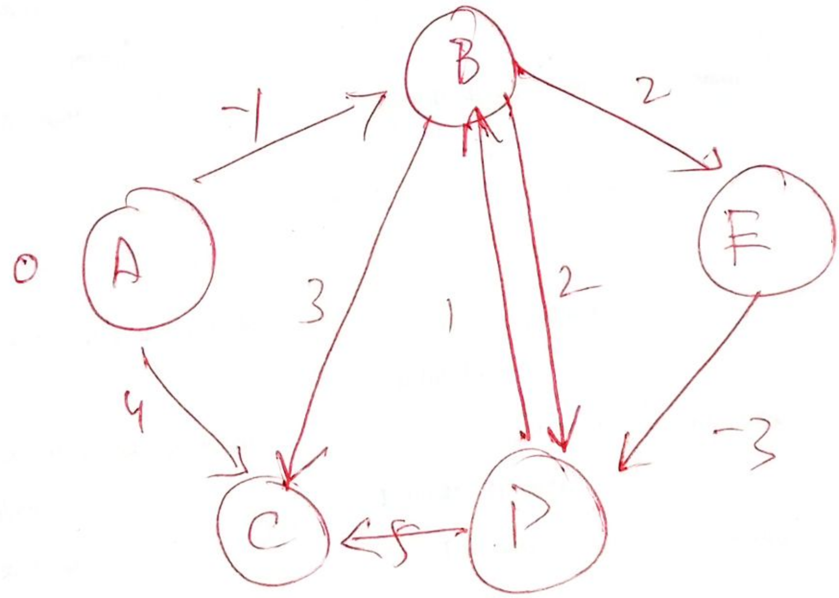
But bellmen ford can detect if we have -ve cycle
run it one more time

dynamic programming

e.g







A	B	C	D	E
0	-1	2	-2	1