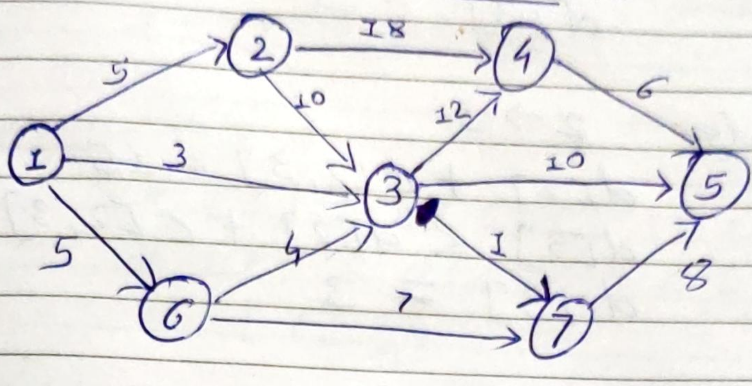
# Quiz - 2

Q-1




Total nodes = 7
Total ~~in~~iteration = 7 - 1

Edges = (1 → 2) (1 → 3) (1 → 6) (2 → 3) (3 → 4)
(2 → 4) (3 → 5) (4 → 5) (6 → 3) (6 → 7) (7 → 5)

Intially, we start from node 1.
Weight of the rest nodes are $\infty$ as they aren't explored.

1st iteration

Edge : (1 → 2)

weight of 1 = 0

cost of (1, 2) = 5

$d[1] + c[1,2] = 0 + 5$
$= 5$

$\infty > 5$

$\therefore d[2] = 5$

Edge : (1 → 6)

$d[1] + c(1,6) = 5$

$d(6) = 5$

Edge $1 \to 3$:

$d[1] + c[1,3] = 3$

$d[3] = 3$

Edge $2 \to 3$

$d[2] + c[2,3] = 15$

$d[3] < d[2] + c[2,3]$

$\therefore d[3] = 3$

Edge $3 \to 4$:

$d[3] + c[3,4] = 15$

$\therefore d[4] = 15$

Edge $2 \to 4$:

$d[2] + c[2,4] = 23$

$d[4] < d[2] + c[2,4]$

$\therefore d[4] = 15$

Edge $3 \to 5$:

$d[3] + c[3,5] = 13$

$d[5] = 13$

Edge $4 \to 5$:

$d[4] + c[4,5] = 21$

$d[5] < d[4] + c[4,5]$

$\therefore d[5] = 13$

Edge $6 \to 3$:

$d[6] + c[6,3] = 9$

$d[3] < d[6] + c[6,3]$

$\therefore d[3] = 3$

Edge $3 \rightarrow 7$ :

$d[3] + c[3,7] = 4$

$d[7] = 4$

Edge $6 \rightarrow 7$ :

$d[6] + c[6,7] = 12$

$\therefore d[7] < d[6] + c[6,7]$

$\therefore d[7] = 4$

Edge $7 \rightarrow 5$

$d[7] + c[7,5] = 12$

$\therefore d[5] > d[7] + c[7,5]$

$\therefore d[5] = 12$

$2^{nd}$ iteration

Edge $1 \rightarrow 2$ :

$d[1] + c[1,2] = 5$

$d[2] = 5$

Edge $1 \rightarrow 6$ :

$d[1] + c[1,6] = 5$

$d[6] = 5$

Edge $1 \rightarrow 3$ :

$d[1] + c[1,3] = 3$

$\therefore d[3] = 3$

Edge $2 \rightarrow 3$ :

$d[2] + c[2,3] = 15$

$d[3] = 3$

Edge $3 \to 4$ :

$d[3] + c[3,4] = 15$

$d[4] = 15$

Edge $2 \to 4$ :

$d[2] + c[2,4] = 23$

$\therefore d[4] = 15$

Edge $3 \to 5$ :

$d[3] + c[3,5] = 13$

$\therefore d[5] = 12$

Edge $4 \to 5$ :

$d[4] + c[4,5] = 21$

$\therefore d[5] = 12$

Edge $6 \to 3$ :

$d[6] + c[6,3] = 9$

$\therefore d[3] = 3$

Edge $3 \to 7$ :

$d[3] + c[3,7] = 4$

$\therefore d[7] = 4$

Edge $6 \to 7$

$d[6] + c[6,7] = 12$

$\therefore d[7] = 4$

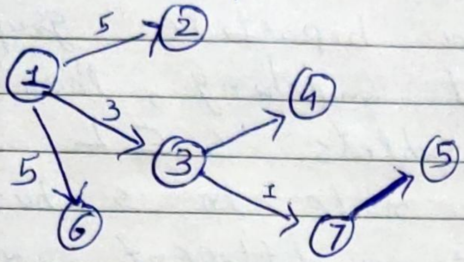
Edge $7 \to 5$ :

$d[7] + c[7,5] = 12$

$\therefore d[5] = 12$

As this iteration has no change, edge dist. will be same for the rest.

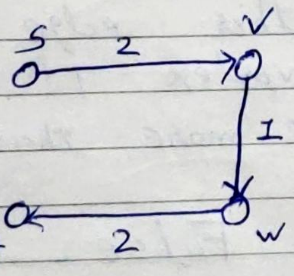
Hence, Final Graph :




To node 2 = 1 → 2
To node 3 = 1 → 3
To node 4 = 1 → 3 → 4
To node 5 = 1 → 3 → 7 → 5
To node 6 = 1 → 6
To node 7 = 1 → 3 → 3

Q-2 Given statement False.

→ Let,
Consider a graph with s, v, w, t and edge (s, v), (v, w), (w, t) and capacities of 2 on (s, v) & (w, t) and capacity of 1 on (v, w)




Then the max. flow has value 1 & this does not saturate the edge out of 's'.

Q-3

→ Let S be a sublet of nodes and N(S) be set of nodes adjacent to nodes in S.

→ If a bipartite graph $G = (L \cup R, E)$ has perfect matching, than $|N(S)| \geq |S|$ for all sublets $S \subseteq L$

→ Each node in S has to be matched to a different node in N(S).

→ If $|L| = |R|$, then graph G has perfect matching if and only if $|N(S)| \geq |S|$ for all subsets $S \subseteq L$.

Q-4 [D] – Ans.

(a) These exist exactly one edge which can be removed to disconnect the graph into 2 pieces, one containing s & other containing t.

→ Proof :-

If the final flow is, then this means then, the min. cut has only one edge of weights, containg u & v. These is no other edge connecting u in S & other vertex T. other wise the flow would be more than,

(b) Answer is False.

This algo has one for loop here if we consider X as n then loop will iterate $n/2$ time so

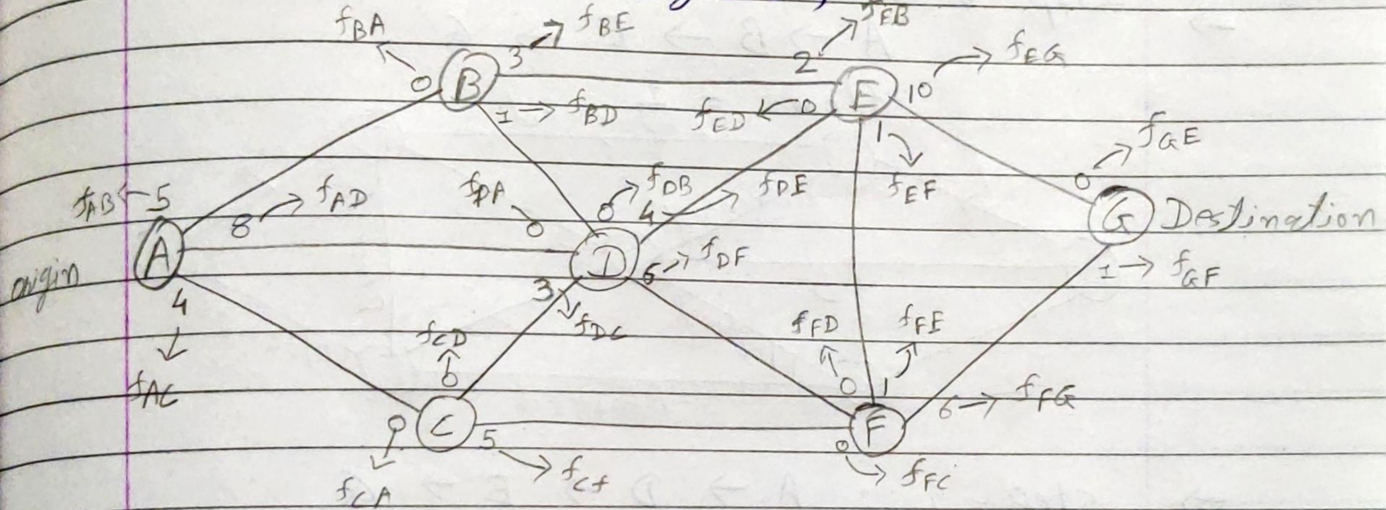
∴ Time complexity $= O(n/2)$

∴ Complexity = linear

∴ Its not polynomial.

Q-5 Maximum flow from A to G in fig-2

Given below figure,




→ step - 1 consider,

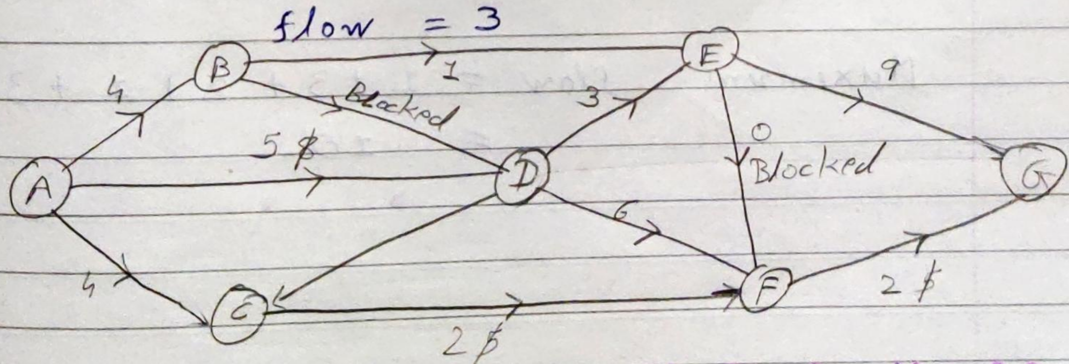
A → B → D → E → G

flow = 1

$f_{BD}$ = Blocked as it has minimum flow

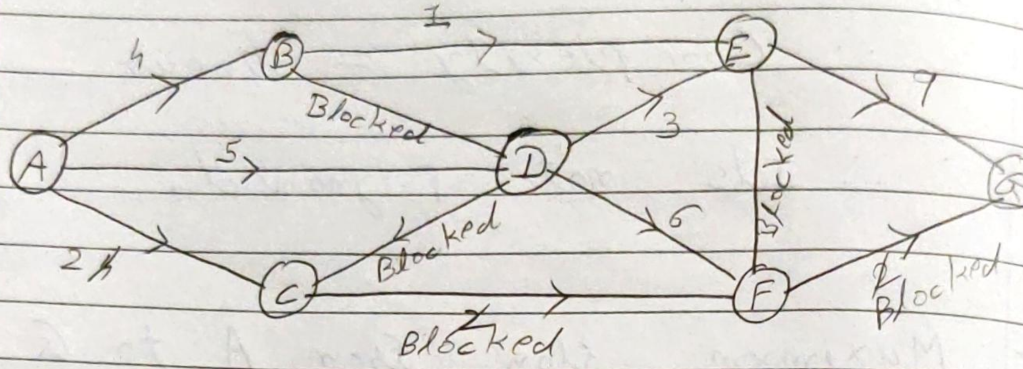
→ step - 2 :- A → D → C → F → G

flow = 3



→ step - 3 : A → C → F → G

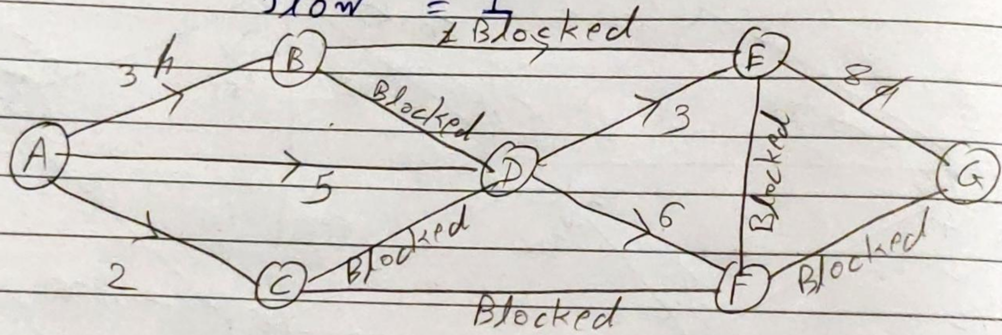
flow = 2




→ step - 4 :

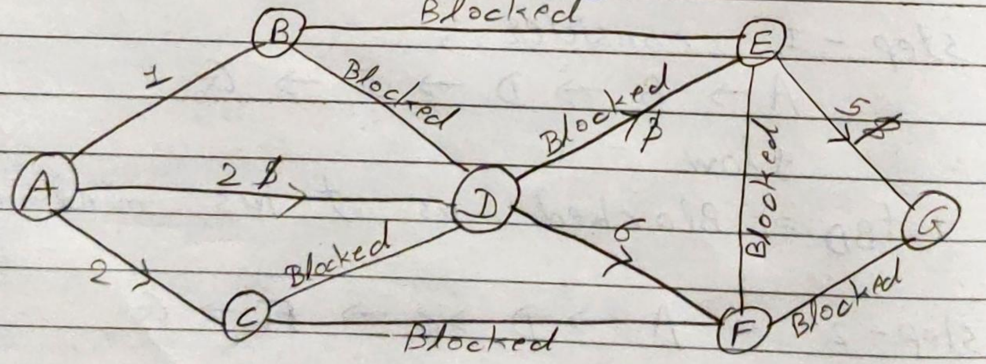
A → B → E → G

flow = 1




→ step - 5 : A → D → E → G

flow = 3




Maximum flow = 1 + 3 + 2 + 1 + 3

= 10.