

Tutorial-11

● Graded

Student

Abhinav Shripad

Total Points

3 / 3 pts

Question 1

(no title)

3 / 3 pts

+ 0.6 pts Written "I do not know how to approach this problem" - 0.6 points Correct

✓ + 1.5 pts Correct constructing of G'
from G - 1.5 points

✓ + 1 pt Brief justification of why the max-flow in G'
is equal to the max-flow in G -
1 point

✓ + 0.5 pts Brief justification of linear time complexity - 0.5 points

COL351: Analysis and Design of Algorithms
Tutorial 11

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Group: 3

Given - H :- multi-source/sink graph

Algorithm :- Convert H to G , single source, sink graph.

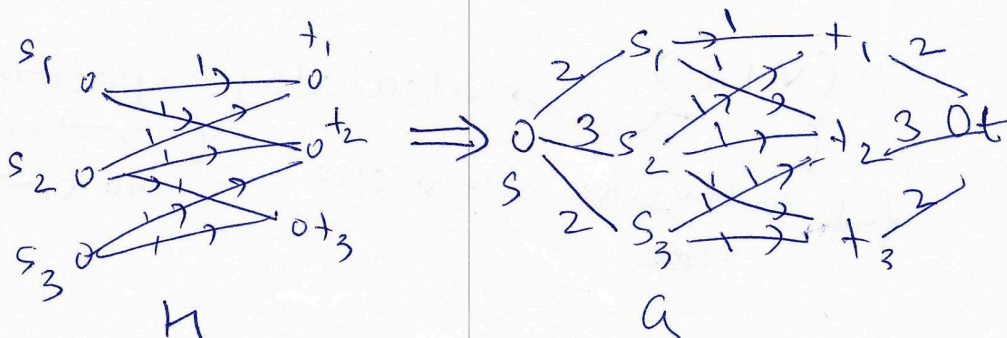
Add 2 vertex, super-sink t & super-source s to $V(H=(V,E))$ with edges such that $s \rightarrow s_i \forall s_i$ and $t_i \rightarrow t \forall t_i$ and edge capacities of

$$s \rightarrow s_i \text{ is } \sum_{(s_i, v) \in E} C_{(s_i, v)} \quad \text{where } (s_i, v) \in E$$

$$\& \ t_i \rightarrow t \text{ is } \sum_{(v, t_i) \in E} C_{(v, t_i)} \quad \text{where } (v, t_i) \in E$$

Find max flow in G . let it be f .

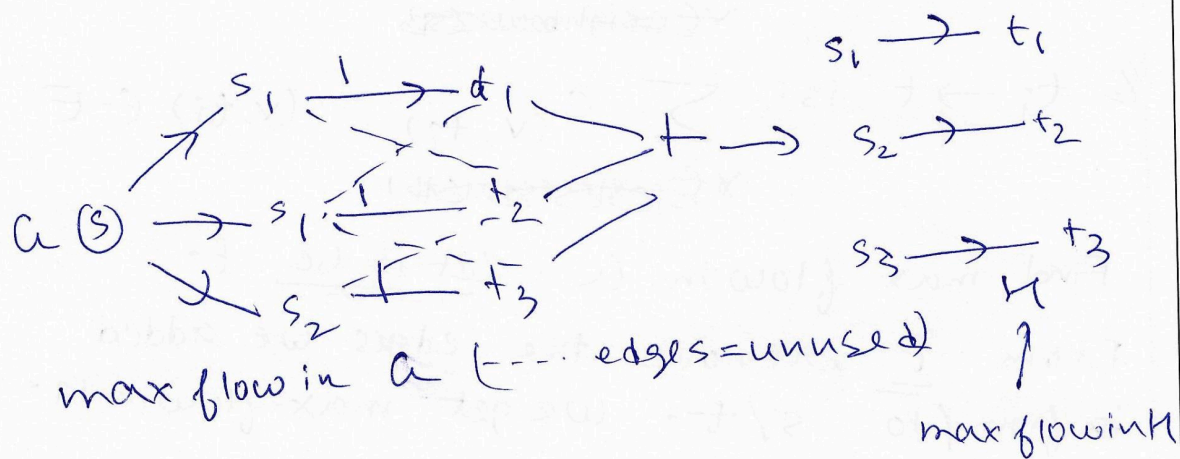
From f , remove the edges we added in from/to s/t . we get max-flow in H .



Proof of correctness:-

Every valid flow f_g in G can be mapped to flow f_H in H (by what's wrote before) and observe that $\|f_g\| = \|f_H\|$

so if f_g is max flow in G , so f_H is max flow in H , because if not, then max flow of H would map to something with more flow in G , contradicting the max flow-ness of f_g .



T.C. = $O(V + E)$
 for each vertex at max one \rightarrow calculating capacities of $s \rightarrow s_i$ and $t_i \rightarrow t$