Algorithm Design and Analysis: Homework 3

Due on Nov 2, 2017 at 9:00am

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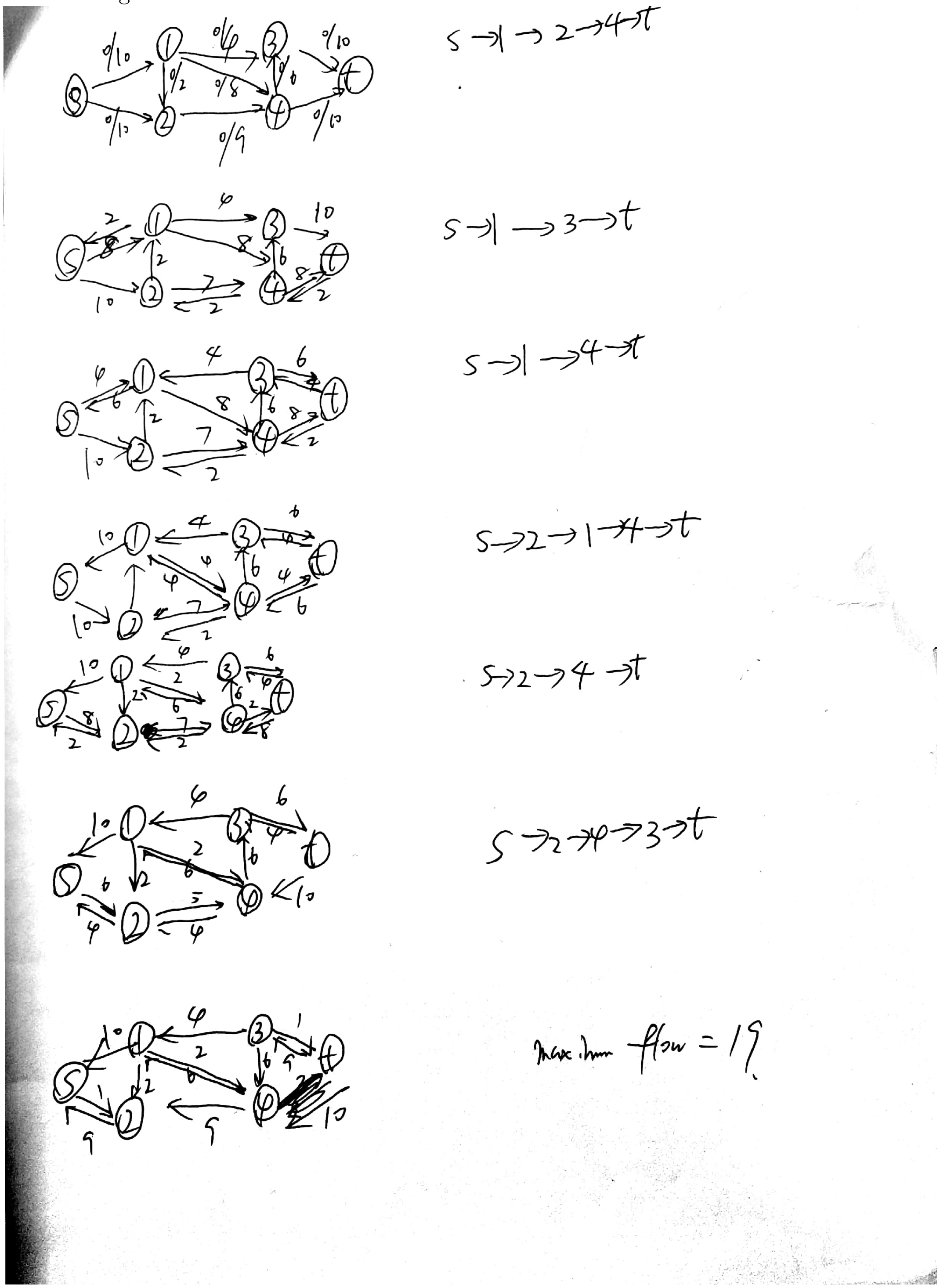
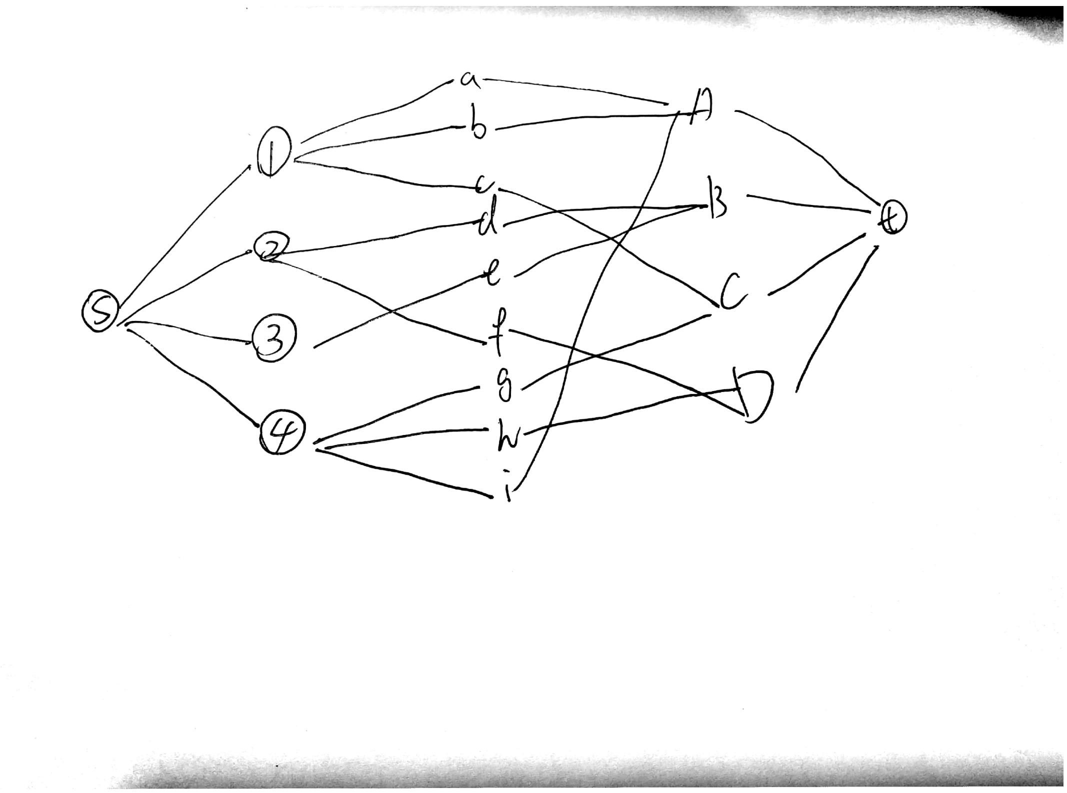
Problem 1

see the image



Problem 2



first we got the 1....k department,every department choose one be the chosen staff. then ,four classes ABCD ,there max flow capacity is m_1, m_2, m_3, m_4draw the network image below.

Problem 3

a) N' be the modified network.

1. Take original max flow f compute N'_f
2. Search argumenting path in N_f'
3. if we find an argumenting path p. return $f+f_p$

otherwise. we return f.

The capacity $c(p)$ of p in N'_f is 1.

$f' = f+f_p$ is a max flow of N

construct residual network takes $O(|V|+|E|)$

find argumenting path takes $O(|V|+|E|)$ $T(n) = O(|V|+|E|)$

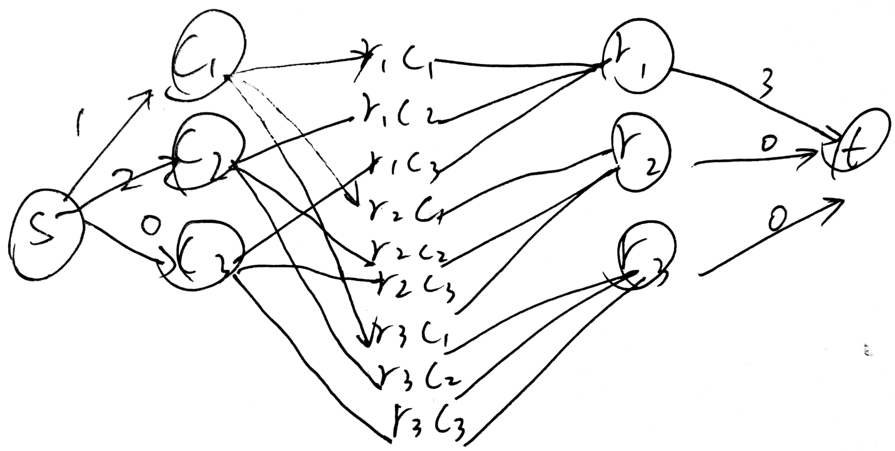
(. BFS)

b). if $f(u,v) < c(u,v)$ it has no effect on the flow. in N'

if $f(u,v) = c(u,v)$.

1) find a simple path $p1$ in N_f from u to s.
2) find a simple $p2$ from t to v
3) take $p2$ $p1$ and route 1 unit of flow t to s along this path adding to f. we get f' of $|f|-1$ f' is a flow in N'
4) perform a search for argumenting path in N'
5). if we find return $f'+f_p$ otherwise return f'

Problem 4



matrix can split into column and row.first of all ,we set column to be the vertex of first level.$R_iC_j$is the second level.R_i is the third level.and we can set both column and row capacity seperately.

Problem 5

we should add a judgement before we do the stardard maximum flow problem.
we find all the edge connecting the node u compare the f(u,v) and c(u) if $f(u,v) > c(u)$ return f(u,v) otherwise return c(u).

Problem 6

first compute a minimum s-t cut C, and define its volume by C.For each edge E_i, try to increase the capacity of e_i by 1 and compute a minimum cut in the new network.if C_i=C for i ,then C_i is also a minimum cut int he origin graph ,if $C_i \neq C$ then the minimum is not unique.if there is a different minimum cut C' in the original graph,e_i is not in C',so $C = C_i$.So,iff $|C| < |C_i|$ has a unique minimum cut and it take most m+1 time,T(n)=O(m).