CS 515

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HW4:

Problem1:

Because the amount of max flow = capacity of minimum cut

For vertex a, b

a∈S ∪ S’ 🡺 a∈S or a∈ S’

b∈T ∩ T’ 🡺 b∈T or b∈T’

for a∈S, we have (a, b) ∈ (S, S’)

for b∈S, we have (a, b) ∈ (T, T’)

So, the edge is saturated in the maximum flow.

Depending on where a is, we have (b, a) ∈ (S, S’) or (b, a) ∈ (T, T’)

And it has no more flow because these cuts are minimal.

So, (S ∪ S’, T ∩ T’) is a minimum cut.

In same way, (S ∩ S’, T ∪ T’) also a minimum cut.

Problem2:

IDK

Problem3:

a.

Assume a directed graph with , is the source, is the target and . For an edge in this graph, has capacity flow , and cost .

Because we need to use linear-programming formulation to find a feasible circulation whose total cost is as small as possible.

For the definition:

Minimize .

Constraints:

for all

b.

Because of problem a, we can have this:

Minimize

Constraints:

for all

So, the dual of problem a is that:

Maximize

Constraints:

Because the capacity has no constraints on edges, and . So, we can get that:

Maximize

s.t.

Problem4:

IDK