CS260 homework 7

#6

build a graph G=(V,E), which xi (i=1 to n) represent switch i and yj(j = 1 to n) represent fixture j

(xi,yj) is an edge if xi and yj does not intersect by any wall. We need O(n^2m) to build the graph.

Then we use O(n^3) time to decide whether G has a perfect matching.

#7

build a graph G=(V,E), which xi(i=1 to n) represent clients and yj(j=1 to k) represent base, then if xi can connect to yj then add edge(xi,yj) with capacity 1. Then add a node S and connect it to all xi with capacity 1, and a node T which connect to all yj with capacity L.

Then there is a way to connect all clients with bases in a feasible way if and only if there is an s-t flow of value n. the running time is to find the max-flow in the graph with O(n+k) nodes and O(nk )edges.

#8

a)build a graph G=(V,E), which xi(i=1 to 4) represent supply and yj(j=1 to 4) represent recieve, then connect xi to yj then add edge(xi,yj) with capacity Max(demandi(i=1 to 4)). Then add a node S and connect it to all xi setting capacity with supply of type i, and a node T which connect to all yj with capacity of demands of type i. then compute the max-flow.

There is a sufficient supply if and only if edges from demand node to T are saturated in max-flow.

b)consider a cut with capacity 99, becase |f|<C so all demands cannot be satisfied.

#9

build a graph G=(V,E), which xi(i=1 to n) represent patients and yj(j=1 to k) represent hospitals, then if xi can connect to yj then add edge(xi,yj) with capacity 1. Then add a node S and connect it to all xi with capacity 1, and a node T which connect to all yj with capacity celling [n/k].

there is a feasible way if and only if there is a s-t flow of value n. same with #7.

#10

if edge e\*=(u,v) which been reduced is not been saturated in max-flow then it won’t affect max-flow.

However, if it’s saturated, construct 2 path, one from u to s, another from v to t. reduce the flow by one. If there is an augmenting path then f’ is not max-flow f is, otherwise f’ is .

#11

the statement is false.

#24

to find the minimum cut is equals to find the maximum flow.

Find the max-flow first. We can get a residual graph Gf.

Find m(the number of nodes connect to s) and n(number of nodes connect to t) .

If m+n = N-2 then s-t cut is unique.