Assignment No 5- CS 538, S2023

Date Due: April 29th, 2023

1. Show that there is a polynomial algorithm for finding flows when even the nodes have capacities. Model this as a Linear program and also show a more direct way of solving the problem.

2. Show that there is a polynomial algorithm for finding flows when the edges in the graph are undirected.

3. An edge cover of a graph G is a subset of edges, D, such that every node in G is incident to an edge in D. Show that the minimum cardinality edge cover has size $|V| - M$ where M is the size of the maximum matching in the graph

4. In the blocking flow algorithm for determining maximum flow, detail the proof that the length of the blocking flow network increases over successive blocking flows.

5. Modify the minimum cost flow algorithm incorporating updates to the dual variables and show that dual feasibility is maintained. Also show that KKT conditions are met thus proving the correctness of the algorithm.

   Analyze the complexity of the algorithm. Is it of polynomial complexity?