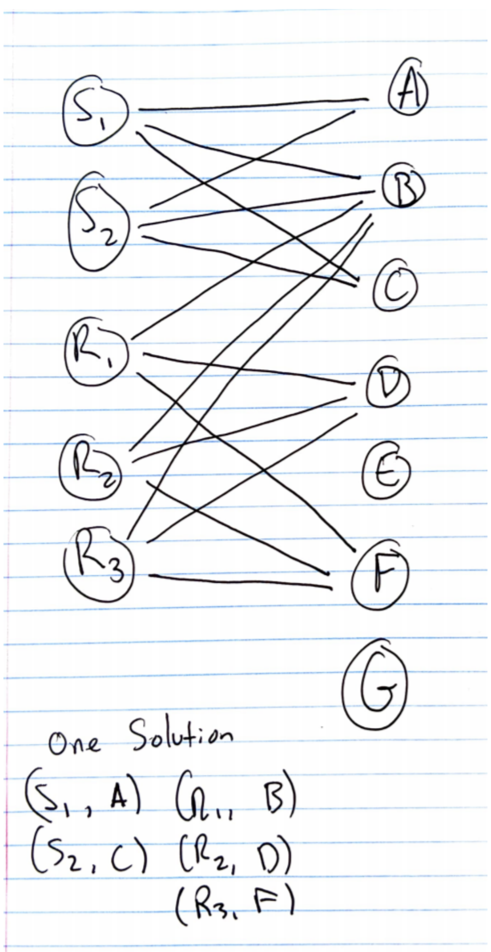
Data Structures and Algorithms Homework 8

Due Wednesday Oct 23; Joseph Sepich (jps6444)

Collaborators: None

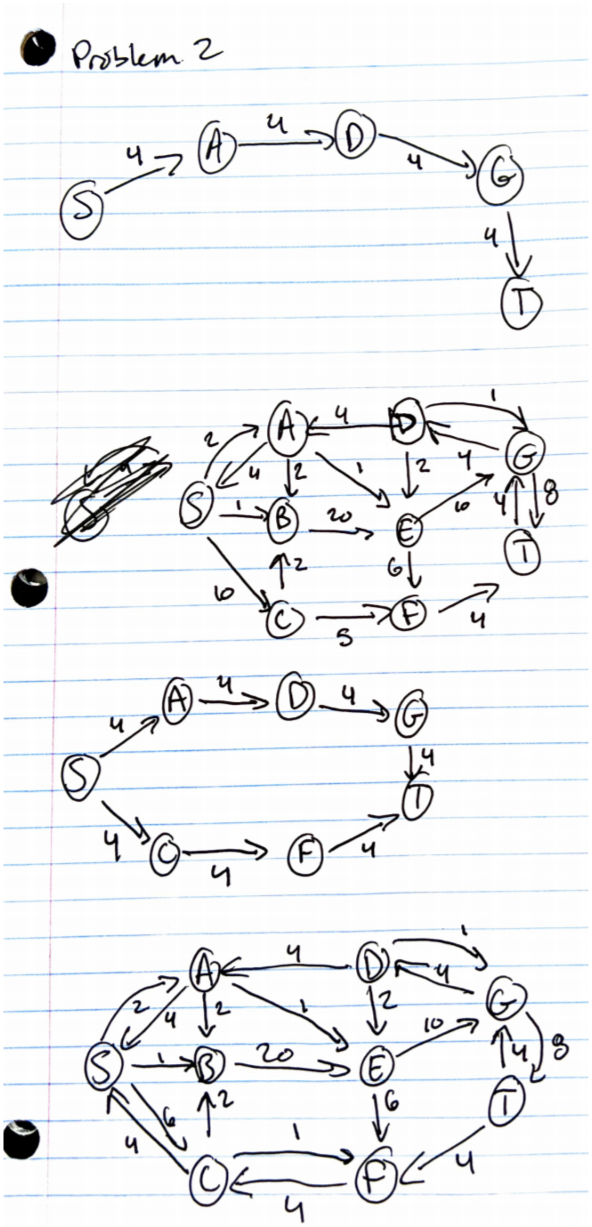
1 Problem 1

This problem requires matching classes to fulfill requirements. You could solve this problem by setting up a bipartite graph, where a set A has vertices S_i where S is a class requirement set, and i is the ith class requied in that set. The other set, set B, has classes as the vertices. For the simple example in the problem with x = 2, and S = {B, C, D, F}, A would have S_1 and S_2 which are both connected to every class in set B = {B, C, D, F}. From here you can run the Ford-Fulkerson algorithm by phrasing this maximum cardinality problem as a flow problem to find the maximum matches. I included an example graph below with more than one set, where it is clear that this can be solved through maximum cardinality matching. (The example graph requires x=2 from S={A,B,C} and x=3 from R={B,D,F}).

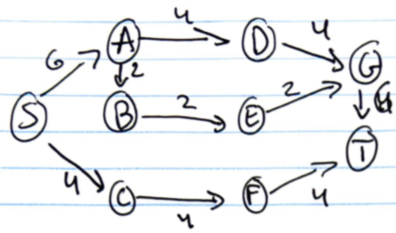


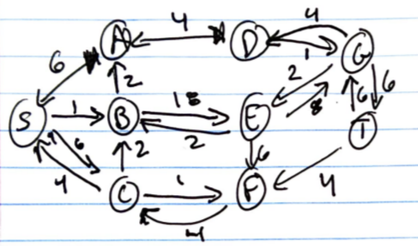
2 Problem 2

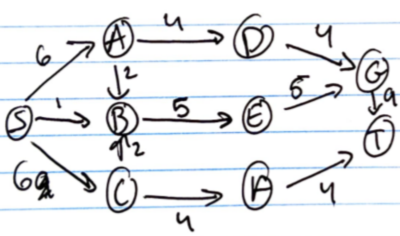
The maximum flow in the graph below from s to t is 13. The corresponding cut from the is A = {S, C F} and V not in A. Below is my iteration through Ford-Fulkerson.



Problem 2





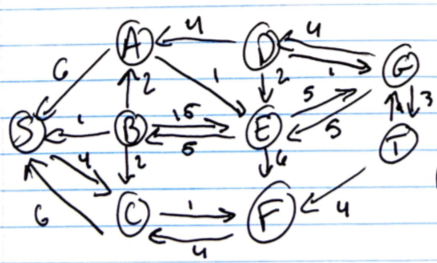


Max flow: 13

s-t cut

A= {S, C, F}

B= V\A



No path

3 Problem 3

4 Problem 4

5 Problem 5

5.1 Part a

5.2 Part b

5.3 Part c