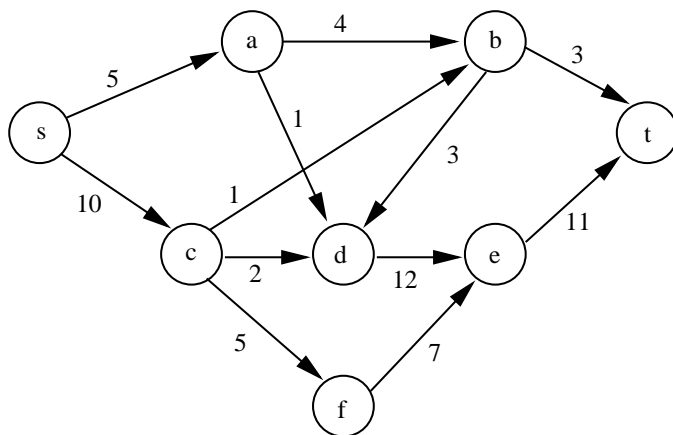


COMP 610 Homework 1

1. Imagine that you have just been confirmed as the head of the super-secret spy agency SRU (Spies 'R' Us). There are a number of countries that you wish to spy upon. These countries are of various sizes and speak a variety of languages. SRU has a number of spies each of whom speaks some languages, but not others. For each country you know how many spies are required to cover its entire territory and the language spoken. For each spy you know what languages he speaks. Obviously, you do not want to assign a spy to a country where he doesn't speak the language. Give a good algorithm to assign spies to countries and find the time complexity of your algorithm.
2. Imagine that you have a large number of sweaters in a variety of styles, colors, and sizes. There are a large number of people each of whom like some of the the sweaters (and are not interested in the others - different people like different sweaters). You want to distribute as many sweaters to these people as possible with the restrictions that no one is given more than 3 sweaters and no one is given a sweater that they don't like. Give a good algorithm to solve this problem and find the time complexity of your algorithm (the more efficient your algorithm the better).
3. Let G be an connected, undirected graph with n vertices and at least n edges. Show that G must have a cycle.
4. What is the maximum number of edges a directed graph with n vertices can have and still not contain a directed cycle? Explain.
5. Assume that you have a network where every arc has a different capacity. Can this network have two different minimum cuts? Either give an example with two different minimum cuts or show that it cannot occur.
6. In the network below, assume that s is the source and t is the sink. Find the maximum flow (both the value and the flow through each edge) and the minimum cut.



7. problem 1.4.4 (page 14)
8. problem 1.4.5 (page 14)