

**Problem: Maximum Flows and Minimum Cuts**

In this report, you will implement the augmenting path algorithm. It is important that you find a maximum flow and a minimum cut by starting with a feasible flow, then improve the flow by pushing flow along an augmenting path. How you find the augmenting path is up to you. While you may use a graph library such as the Sage Graph Library, you cannot use existing flow algorithms or use a linear programming solver.

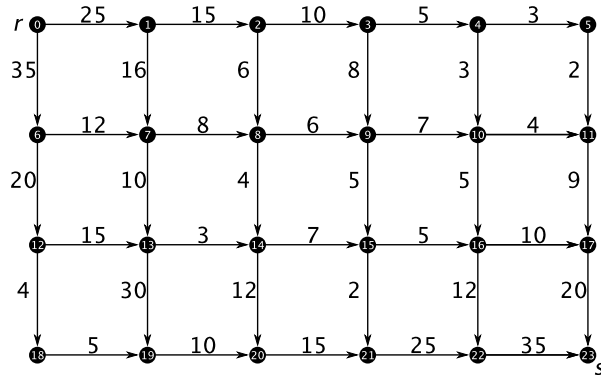
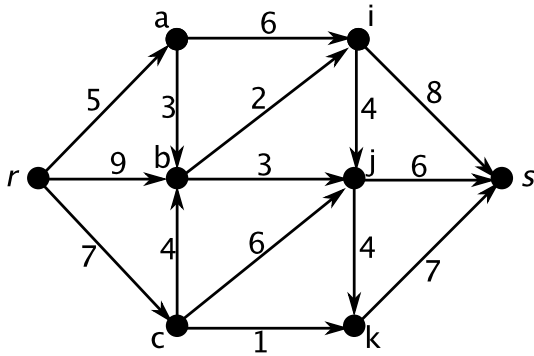
Remember, the point of this report is for you to explain your solution to the point that we can believe that you implemented the algorithm correctly. So include as many details as you feel is appropriate, but do not simply paste code without a corresponding discussion that *explains* that code.

**Questions To Answer.** These questions should be answered within the body of your report. *Do not simply answer these in separate items!*

- Q1. Describe how you store the flow network as a graph.
- Q2. Describe your algorithm for finding an augmenting path.
- Q3. Describe your algorithm for finding a minimum cut when no augmenting path exists.
- Q4. What language, libraries, and environments did you use?
- Q5. What challenges did you encounter during your implementation?
- Q6. What online/library resources did you use?

**Problem Instances.**

**I1 & I2.** Encode the following networks and capacities into flow problems and find maximum flows and minimum cuts for each.



**I3 & I4.** See the files flow3.txt and flow4.txt on the course web page for two lists of edges and their capacities. Also note that the vertices *r* and *s* are specified in these files, and are not necessarily