FALL 2019: **COT 6405** Analysis of Algorithms

[Homework 6; Due 11:59 PM, Dec 3, via Canvas]

General submission guidelines and policies: Add the following signed statement. Without this statement, your homework will not be graded.

> I have adhered to the collaboration policy for this class. In other words, everything written down in this submission is my own work. For problems where I received any help, I have cited the source, and/or named the collaborator.

Problems

28. (**Regular**) Modify Floyd-Warshall's algorithm to output the number of distinct shortest paths between every pair of vertices in an unweighted undirected graph.

29. (**Regular**) Given a weighted undirected graph $G(V, E)$ with n vertices, assume that you have run Floyd-Warshall's algorithm to compute the length of the shortest paths between every pair of vertices in a weighted undirected graph. Now suppose that a new vertex v is added to the graph and you are given a select set of edges that connect this new vertex to the other vertices (along with their weights). Will this affect the shortest path lengths you have already computed between the other pairs of vertices? Design an efficient algorithm to recompute all values, if needed. Discuss correctness and time complexity of your solution.

30. (**Exercise**) Modify the BCC algoroithm we discussed in class to print out all *bridges* of an unweighted, undirected graph. Note that a *bridge* is an edge whose removal disconnects the graph.

31. (**Exercise**) How many *articulation points* are there in a *star graph*? A star graph is a tree with one vertex connected to all the other vertices.

32. (**Exercise**) Write down the biconnected components of the graph shown in Figure 22.10 on page 622.

33. (**Exercise**) Solve problem 26.1-2 on page 713

34. (**Regular**) Solve problem 26.1-6 on page 714.

35. (**Exercise**) Solve problem 26.3-1 on page 735.