CSCD320 Homework8, Spring 2014 Eastern Washington University. Cheney, Washington.

Name: Brandon Fowler **EWU ID:** 00639348 **Due:** 11:59pm, June 8, 2014 (Sunday)

Please follow these rules strictly:

1. Write your name and EWUID on **EVERY** page of your submission.

2. Verbal discussions with classmates are encouraged, but each student must independently write his/her own solutions, without referring to anybody else's solution.

3. The deadline is sharp. Late submissions will **NOT** be accepted (it is set on the Blackboard system). Send in whatever you have by the deadline.

4. Submission must be computer typeset in the **PDF** format and sent to the Blackboard system. I encourage you all to use the LATEX system for the typesetting, as what I am doing for this homework as well as the class slides. LATEX is a free software used by publishers for professional typesetting and are also used by nearly all the computer science and math professionals for paper writing.

5. Your submission PDF file must be named as:

firstname_lastname_EWUID_cscd320_hw8.pdf

(1) We use the underline ‘ ’ not the dash ‘-’.
(2) All letters are in the lower case including your name and the filename's extend.
(3) If you have middle name(s), you don't have to put them into the submission's filename.

6. Sharing any content of this homework and its keys in any way with anyone who is not in this class of this quarter is NOT permitted.

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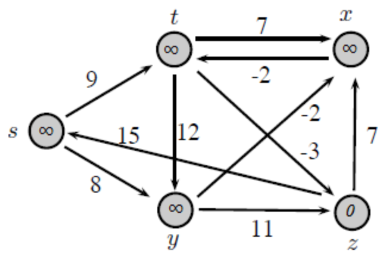
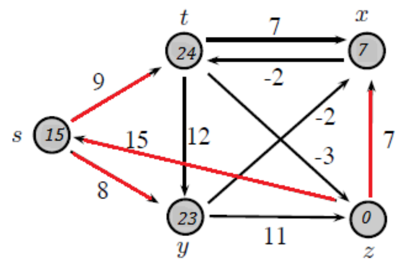
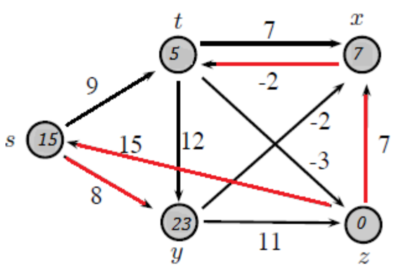
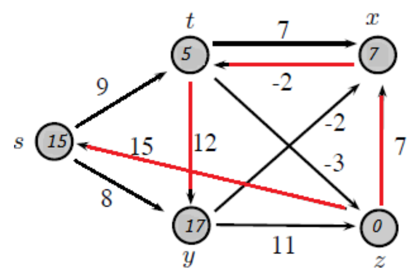
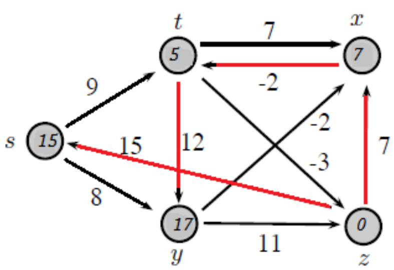
Problem1 (30 points)**.** *Show the trace of the Bellman-Ford algorithm on the following directed graph,* **using vertex** z **as the source**. *In each pass, relax edges in the order of* (t, x), (t, y), (t, z), (x, t), (y, x), (y, z), (z, x), (z, s), (s, t), (s, y)*. Show the* d *values after each pass. (A similar trace which starts from vertex* s *can be found in Figure 24.4 of CLRS, 3rd Ed., but in this homework problem you start from vertex* z *and also do not need to show the* π *values.)*











Done

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Problem2 (35 points)**.** *Give an* O(|V |·|E|)*-time algorithm for computing the transitive closure of a directed graph* G = (V,E)*. You can assume* |E| ≥ |V |.

```
int closure[G.V][G.V] = 0 for every element

computeClosure(G);



computeClosure(Graph G){

        for(int n = 0; n < G.V; n++){

                dfs(G,n,n);
        }
}



dfs(Graph G, int i, int j){

        closure [i][j] = 1;

        int v;

        for(Node cur = G.adj[j] ; cur != null; cur = cur.next){

                v = cur.vertex;

                if(closure[i][v] == 0){

                        dfs(G,i,v);
                }
        }
}
```

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Problem 3 (35 points)**.** *The Floyd-Warshall algorithm uses the matrix* $D^{(0)}$ *to find the all-pair shortest paths. That is, it uses* $D^{(0)}$ *to calculate the matrices* $D^{(1)}, D^{(2)}, D^{(3)}, \ldots, D^{(n)}$*, where each entry* $d^{(n)}_{ij}$ *in* $D^{(n)}$ *is the shortest distance from* i *to* j*, for every* i *and* j*,* $1 \le i, j \le n$*. Given the following example* $D^{(0)}$*, calculate* $D^{(1)}$*,* $D^{(2)}$*,* $D^{(3)}$*, and* $D^{(4)}$*. You don't have to show the details of the calculation, instead you can just show the content of each matrix of* $D^{(1)}$*,* $D^{(2)}$*,* $D^{(3)}$*, and* $D^{(4)}$*.*

$$D^{(0)} = \begin{pmatrix} 0 & 5 & \infty & 3 \\ \infty & 0 & -1 & \infty \\ 6 & \infty & 0 & \infty \\ \infty & 2 & 7 & 0 \end{pmatrix} \longrightarrow D^{(1)} = \begin{pmatrix} 0 & 5 & \infty & 3 \\ \infty & 0 & -1 & \infty \\ 6 & 11 & 0 & 9 \\ \infty & 2 & 7 & 0 \end{pmatrix}$$

$$D^{(2)} = \begin{pmatrix} 0 & 5 & 4 & 3 \\ \infty & 0 & -1 & \infty \\ 6 & 11 & 0 & 9 \\ \infty & 2 & 1 & 0 \end{pmatrix} \longrightarrow D^{(3)} = \begin{pmatrix} 0 & 5 & 4 & 3 \\ 5 & 0 & -1 & 8 \\ 6 & 11 & 0 & 9 \\ 7 & 2 & 1 & 0 \end{pmatrix}$$

$$D^{(4)} = \begin{pmatrix} 0 & 5 & 4 & 3 \\ 5 & 0 & -1 & 8 \\ 6 & 11 & 0 & 9 \\ 7 & 2 & 1 & 0 \end{pmatrix}$$

Done