Due: Dec 6, 2016, in class.

Note: For questions 1-4, you are recommended to implement the algorithms in computer and show the corresponding results (including the progress of the tables/arrays for question 1-3).

1. (20 points) Please compute the shortest paths from vertex a to all the others in Fig. 1 by Dijkstra algorithm. Also show the progress of the changes of $\pi$ value and $d$ value for each vertex.

![Figure 1: The weight of each edge is labeled.](image1)

2. (20 points) Please compute the shortest paths from vertex a to all the others in Fig. 2 by Bellman-Ford algorithm. Similar to question 1, also show the progress of the changes of $\pi$ value and $d$ value for each vertex.

![Figure 2: The weight of each edge is labeled.](image2)

3. (20 points) Please compute the all pairs shortest paths in Fig. 2 by Floyd-Warshall algorithm. Also show the corresponding arrays $D^{(1)}$ to $D^{(5)}$.

4. (20 points) Solve the following case for Knapsack problem: the capacity $K = 7$, 5 items with weights $w_1 = 2, w_2 = 8, w_3 = 6, w_4 = 1, w_5 = 1$, and profits $p_1 = 10, p_2 = 21, p_3 = 15, p_4 = 4, p_5 = 4$. Also show the final two arrays Profit[*][*] and Dir[*][*].

5. (20 points) Consider the Knapsack problem but with two knapsacks, and both capacities are $K$. Describe your idea how to solve this problem.
6. (bonus for extra 20 points) Consider a generalization of question 5, you have $t$ knapsacks, and all have capacity $K$. Describe your idea how to solve this problem.