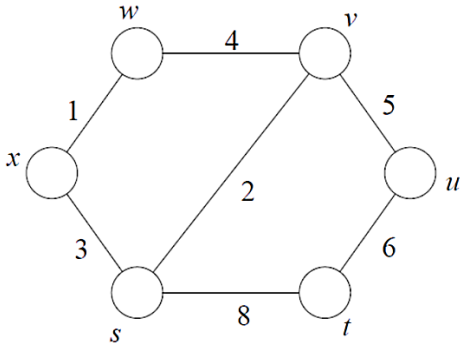
Algorithm 2017 Spring

Homework 4

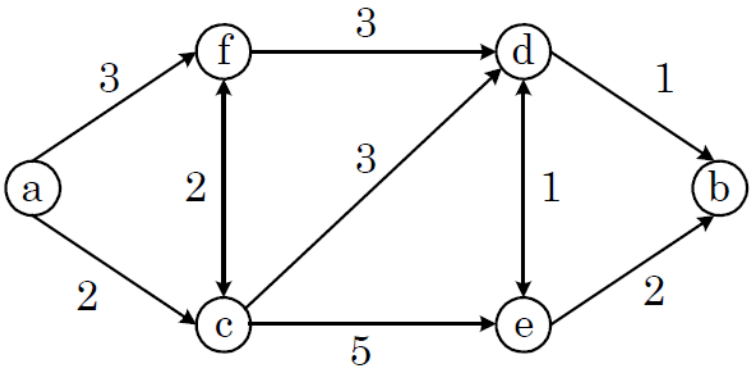
範圍：Chapter 22~ Chapter 24

1. **(20pts) Given the following undirected graph.**
   Please use the Depth-First-Search algorithm to show the timestamp (discovery time and finish time) starting from vertex s of each vertex on it.

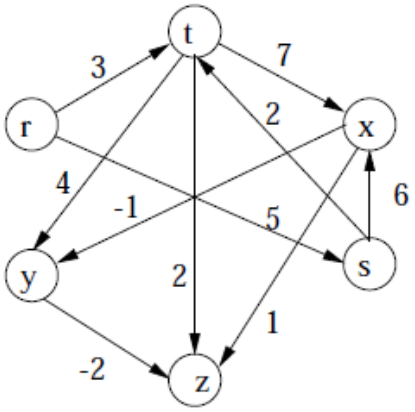


2. **(20pts) Find a feasible solution or determine that no feasible solution exists for the following system of difference constraints**
   $x1 - x2 \le 4$, $x1 - x5 \le 5$, $x2 - x4 \le -6$, $x3 - x2 \le 1$,
   $x4 - x1 \le 3$, $x4 - x3 \le 5$, $x4 - x5 \le 10$, $x5 - x3 \le -7$,
   $x5 - x4 \le -8$

3. **Consider the single-source shortest-paths problem. The execution process of Dijkstra's algorithm can be decomposed into $V-1$ stages. At each stage, the algorithm finds a shortest path from the source to a vertex.**
   (a) **(10pts) Describe such a process clearly on the following di-graph with vertex a as the source.**
   (b) **(10pts) Under what condition Dijkstra's algorithm will not work? Given an example to explain your answer.**



4. **(20pts) Run DAG-SHORTEST-PATHS step by step on the directed graph of the figure, using vertex s as the source.**



5. **(20pts) Give an algorithm (or pseudocode) that determines whether or not a given undirected graph G = (V ,E) contains a cycle. Your algorithm should run in O(V) time, independent of |E|. Please explain your answer.**