# CSE 5311 Project (Network Flow)

This project contains following files for solution of question 1 and question 2.

**Files**:

**EdmondKarpMaxNetworkFlow.java** : This file has implementation of Graph, BFS traversal and max network flow.
**SolutionOne.java :** This file reads the input provided and do basic input validation. (Rename if you are going to use this file for both solutions)

**Implementation:**

**Solution 1:**

Approach here is to construct graph in a way that one single task can be done by only one worker and worker can do only maximum allowed tasks. For this, we added source and sink nodes in the graph apart from worker and task nodes. To restrict tasks to one worker we make task to sink edge with max flow set to 1. To restrict workers, we add edges from source to worker with max flow capacity set to maximum tasks that worker can do. For each task, we add edge from qualified worker to task with max flow capacity one.

Once graph is constructed, we run Edmond Karp algorithm to find out the maximum network flow of the graph. Because graph has edge flow capacity in certain ways, after finding max network flow, we can look for edges from workers to tasks. If edge is set to one it means that the task is assigned to that worker and it also satisfy the given constraints.

**Sample Input**

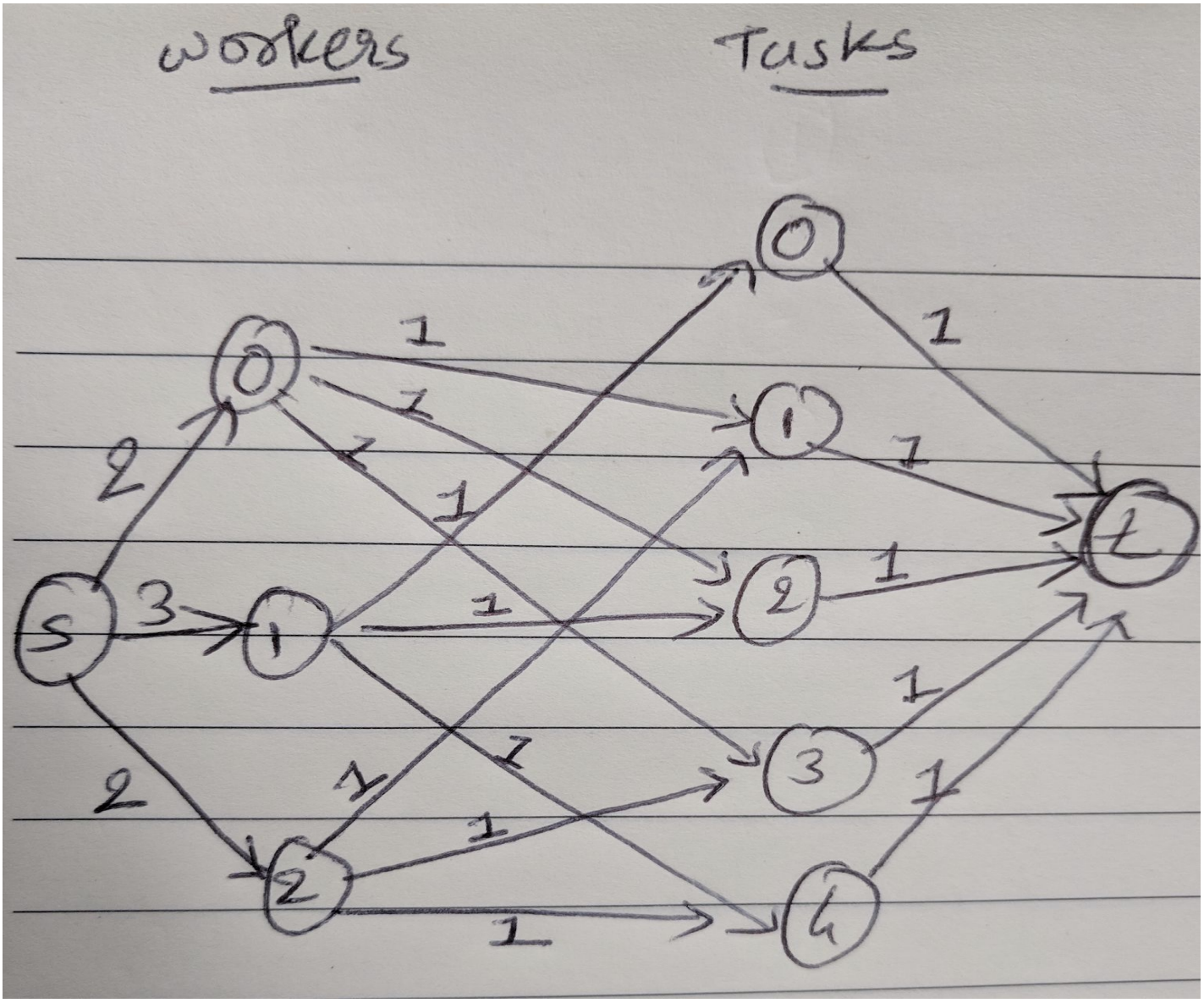
To run this algorithm, use following command format.

java SolutionOne <Task file> <Worker file>

1) Positive Test case
Solution is possible and all jobs are assigned to qualified workers.

**Files:** TaskOneCaseOne.txt and WorkerOneCaseOne.txt

Input Graph:




Output:

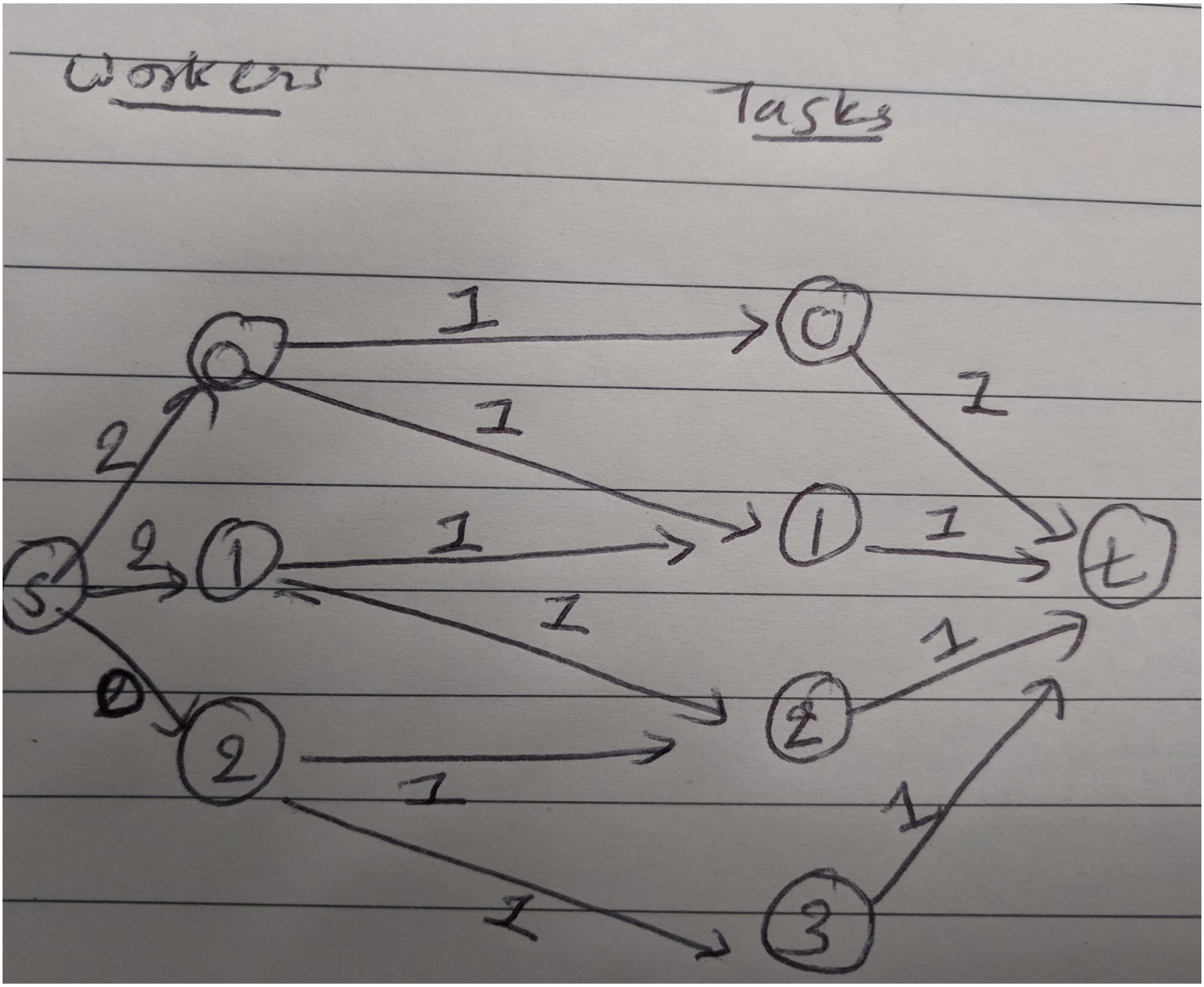
<Add output of SolutionOne - Only print max flow and final solution>

Negative Test case

2) There is no solution possible.

**Files:** TaskOneCaseTwo.txt WorkerOneCaseTwo.txt

Input Graph:




Output:
<Add output of SolutionOne>

3) Invalid Input
TaskDetails provided is not valid.

**Files:** TaskOneCaseThree.txt WorkerOneCaseThree.txt

Output:
<Add output of SolutionOne>

4) Invalid Input
WorkerDetails provided is not valid.

**Files:** TaskOneCaseFour.txt WorkerOneCaseFour.txt

Output:
<Add output of SolutionOne>