Homework 9 (Posted 9th April, Due during or before class 16th April)

Problem 1: 5 pts Consider a graph where weight of a path is the product of the weight of all edges in the path. Weight of any edge is greater than 1. Give an algorithm to compute the shortest path and analyze its complexity.

Problem 2: 5 pts Prof. Beevan claims that the topological sort algorithm works if the vertices are sorted in increasing order of finish times and the edges are not reversed. Do you believe him? Justify your answer. Please be elaborate in this answer. If you give a proof, be thorough. If you give a counterexample, show all the steps.

Problem 3: 10 pts You can obtain a topological sort by repeated reduction of in-degrees of vertices in a DAG. Give a topological sort algorithm along these lines and analyze its complexity.

Problem 4: 10 pts You have a list of jobs. Some jobs can not start before some others finish, and these conditions are given. Each job has an operation time, e.g., if job A starts at $t = 5$, it can finish only 5 units later, i.e., at $t = 10$. Give an algorithm to find the minimum time by which all jobs can finish. Analyze its complexity. You may assume that the earliest time a job starts is $t = 0$.

Problem 5: 10 pts A digraph is semi-connected if for any pair of vertices u, v either u is connected to v or v is connected to u. Give an algorithm to find out whether a digraph is semi-connected or not, and analyze its complexity.