CSCI 570 - Fall 2016 - HW 9

Due November 5, 2016

1. There is a precious diamond that is on display in a museum at m disjoint time intervals. There are n security guards who can be deployed to protect the precious diamond. Each guard has a list of intervals for which he/she is available to be deployed. Each guard can be deployed to at most A time slots and has to be deployed to at least B time slots. Design an algorithm that decides if there is a deployment of guards to intervals such that each interval has either exactly one or exactly two guards deployed.

2. The computer science department course structure is represented as a directed acyclic graph G = (V, E) where the vertices correspond to courses and a directed edge (u, v) $\in$ E exists if and only if the course u is a prerequisite of the course v. By taking a course w $\in$ V , you gain a benefit of b_w which could be a positive or negative number. Design an algorithm that picks a subset A $\subseteq$ V of courses to take such that the total benefit $\sum_{\omega \in A} b_\omega$ is maximized. Remember that if v $\in$ A and (u, v) $\in$ E, then u has to be in A. That is, to take a course, you have to take all its prerequisites. The running time should be polynomial in |V |.

3. Solve Kleinberg and Tardos, Chapter 7, Exercise 28.