CS 4349.006 Homework 10

Due Thursday, December 2 on eLearning

Please solve the following **2** problems.

1. Suppose we are given a flow network $G = (V, E)$ in which every edge has capacity 1, together with a positive integer k. Describe and analyze an algorithm to identify k edges in G such that after deleting those k edges, the value of the maximum (s, t)-flow in the remaining graph is as small as possible.

2. Suppose you are given an $n \times n$ checkerboard with some of the squares deleted. You have a large set of dominoes, each just the right size to cover two adjacent squares of the checkerboard. Describe and analyze an algorithm to determine whether one can tile the board with dominoes—each domino must cover exactly two undeleted squares, and each undeleted square must be covered by exactly one domino.

   Your input is a boolean array $Deleted[1 .. n, 1 .. n]$ where $Deleted[i, j] = \text{TRUE}$ if and only if the square in row i and column j has been deleted. Your output is a single boolean; you do ***not*** have to compute the actual placement of the dominoes. For example, for the board shown below, your algorithm should return TRUE.

   Advice: Reduce to bipartite matching.

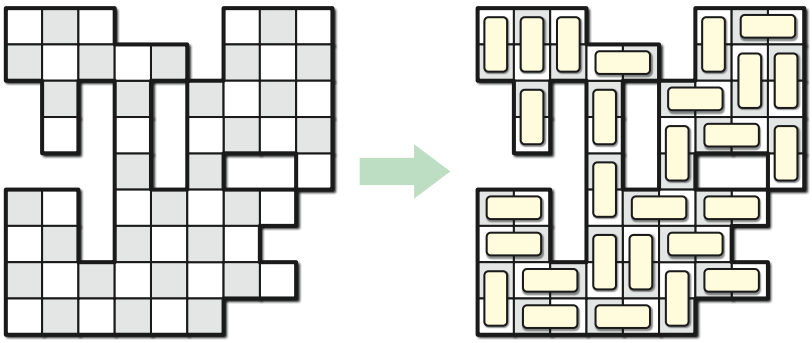

Figure 1. Covering a partial checkerboard with dominoes.