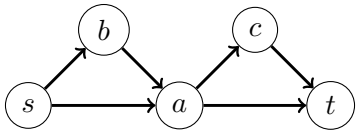
CSE421: Design and Analysis of Algorithms May 24, 2022

Shayan Oveis Gharan Problem Solving Session 5

P1) Given an (unweighted) directed graph $G = (V, E)$, a pair of vertices s, t and an integer $1 \leq k \leq n$. Design an algorithm that runs in time polynomial in n, k and outputs yes if there are k *vertex* disjoint paths from s to t and no otherwise. For example, in the following graph there are two edge disjoint paths from s to t but no two vertex disjoint paths from s to t.



P2) A domino is shape like  or  . Given an $n \times n$ table where some of the squares are removed (in the picture below removed squares are marked with an X), design an algorithm that runs in time polynomial in n and outputs the minimum number of extra squares to remove from the table such that we cannot put any domino in the remaining table.

For example, given the table on the left (where 3 squares are removed) you should output 2. In particular if you remove the two squares marked with X on the right you cannot place any dominoes on the remaining cells.

X		
		X
	X	

$\Rightarrow$

X	X	
X		X
	X	