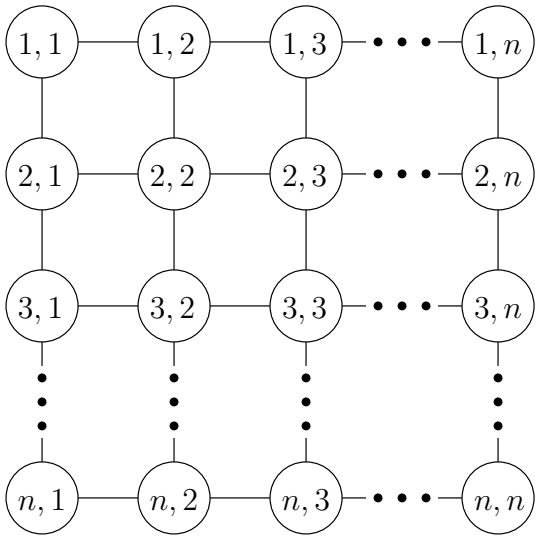
Homework Assignment #6
Due: March 13, 2023 at 7:00 p.m.

1. Consider an $n \times n$ mesh network, as shown below. Each circle represents a processor, labelled by its row and column number. Each edge connecting two processors represents a wire.



The edge connecting processor (i, j) to (i', j') has an associated *bandwidth*, denoted $B(i, j, i', j')$, which describes the number of bits that can be sent across the edge per second. The bandwidth of a path through the network is the *minimum* bandwidth of any edge in the path.

The processor $(1, 1)$ at the top-left corner of the grid has a stream of data to send to the processor (n, n) at the bottom-right corner. It must send the stream of data along a single path through the network, using a minimal number of edges. (Thus, the data should always move right or down, never up or left). You must efficiently compute the *maximum* bandwidth of any such path.

This problem can be solved using dynamic programming. Your solution should include the following items.

[1] **(a)** How many possible paths are there? Briefly justify your answer.

[2] **(b)** Provide a clear definition of the array you are using (including its dimensions and a clear English description of what the value stored in each element of the array is supposed to represent).

[2] **(c)** Give equations you use to fill in your array, together with some explanation of why the equations are correct.

[2] **(d)** Give pseudocode that fills in your array.

[2] **(e)** Give pseudocode that uses the array to print the required path.

[1] **(f)** What is the total time required to compute your array and print out the optimal path? Briefly justify your answer.