*CSE 102*

**ARRAYS - II**

1. Write a function which takes an integer matrix *m* and two integers i,j and returns a sub-matrix of *m* whose upper-left corner is the (0,0) cell of *m* and the bottom-right corner is (i,j) cell of *m.*
2. Sudoku is a famous game played on a 9x9 square grid which is further subdivided into 9 3x3 squares. The goal of the game is to fill the entire grid with digits from 1 to 9 in such a way that no row, no column or no 3x3 subdivision contains any duplicate. Write a function which takes a filled Sudoku grid and decides whether it’s a valid solution.



1. Write a function which takes two matrices of suitable dimensions, performs a matrix multiplication and returns the result. (Look up matrix multiplication if you need)
2. Consider a snake game (where there is no food) where we represent the snake with the true values of a Boolean matrix, together with the coordinates of the head of the snake. Write a function which takes a Boolean matrix representing a state of the game, two integers representing the head of the snake and a char representing the direction of the next move, which is either ‘L’, ‘R’, or ‘S’; standing for left, right and straight respectively. Your function should return a Boolean value indicating whether the game ends with the next move (by snake eating itself). Note that there are no walls and the snake moving out of one side of the matrix means entering the scene on the opposite side.
3. Consider a Boolean matrix representing a maze-like map, where false values represent walls and true values represent roads. Let us call true values at the edge of the matrix entrance points. Imagine an agent which can only move to right, left, up or down direction. Write a function which takes such a map (a Boolean matrix) and checks if there is at least one path between two distinct entrance points.
4. Consider an integer matrix representing altitude values of a terrain. Write a function which takes a terrain map represented with an integer matrix and marks all hills and holes on it.