HW11

Problem 1: Is it bottle neck?

In order to check if an edge is a bottle neck or not, we still could use Ford-Fulkerson algorithm. With Ford-Fulkerson, to have a better time complexity, we could implement ~~it with~~ Edmonds-karp algorithm. The time complexity for this is $O(VE^2)$ which is the optimized form of Ford-Fulkerson algorithm of $O(E|max\_flow|)$.

We could use Edmond-Karp iteratesover the graph using BFS until we have the final residual graph. Now, we will be able to get a set of nodes that are reachable from source and a set of nodes that are reachable from sinks.

Hence, there exists
$\Rightarrow$ $\exists$ the bottle neck edges for any edges that are connect ~~to~~ the first set of nodes to the second sets of nodes.

So if the edge that we are checking is the edge that connect the first set of nodes to the second set of nodes, that edge is a bottle neck edge.

Time complexity $= O(VE^2)$ as we implement Edmonds Karp.

Problem 2: Designation matching pattern

Assuming the students are sitted randomly and we do not know if they only want an arrangment of red or what not, what we could do is:

1). looping throwugh each row ~~and column~~ to check if there are any red dress student
2). if there is, add that the to designation subset of red dress (designation subset of a dress is a set that we create prior to looping through each row of the grid in 1). ~~to~~ and mark the column of the student as unavailable
3). iterate until we finish all the row
4). after all row are iterated through, check for any remaining red dress students in column that is not marked unavailable
5). if there are, add to the designation subset
6). return the size & configuration of designated subset.

Since we only loop through the row, wait till it finishes then loop through the column later on, the time complexity for this algorithm is $O(n)$