Week 10 Submission

Question 1 Submission Question

(a) In the execution of Bellman-Ford Algorithm, can you randomise the order that you relax the edges at each iteration? Explain your answer.

No, the order that you visit the edges must be the same for each iteration. This is because if we try to relax an edge of any vertex that has not been visited yet then there will be no change in the shortest path found for that vertex. Additionally, a path to an edge can be returned that is not the shortest if we relax the edges in a random order.

(b) In the matrix multiplication method for all-pairs shortest path, explain why to compute $L_{(8)}$, you only need to compute $L_{(4)}$ (i.e. there is no need to compute $L_{(5)}$, $L_{(6)}$, and $L_{(7)}$.

We only need to compute $L_{(4)}$ in order to compute $L_{(8)}$ because the operation we're doing is associative. Therefore, we have:
$L_{(4)} = W^2 \times W^2 = W^4$
$L_{(8)} = W^4 \times W^4$

(c) In the execution of the Floyd-Warshall Algorithm, what does it signify when the diagonal of the matrix contains a negative number instead of a zero?

The diagonal of the matrix for the Floyd-Warshall algorithm contains the weights of the path from a vertex *v* to itself. If the diagonal of the matrix contains a negative number instead of a zero, then it means there is a path from vertex *v* to vertex *v* that is a negative cycle and is therefore undefined.