CSC 226 Assignment 3

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1)
Using a modified Bellman-ford algorithm this can be achieved by running another iteration of the algorithm after the optimal path has been found. Once the optimal path has been found we simply run a modified version of the algorithm again but rather than updating the edges to their new values we simply mark them as negative infinity because they cannot be better than the already found optimal path so it must be part of the negative cycle. After this we just check the distance array and find all edges marked as negative infinity, if there are any then those vertices are part of the negative cycle.

2)
Dijkstra's algorithm makes the assumption that paths will only get longer when more edges are added to a path. This means that with a simple example such as

A
5 / \ 2
B --- C
-10

That it will assume in step one of finding the shortest path from A to C that A->C is shortest because it's shorter than just A->B and therefore won't check if A->B->C is shorter than A->C.

3)
Because it is an even graph meaning every vertex has an even degree. This intern means it is an Eulerian graph. Because of this we are able to trace the Eulerian circuit to determine the cycles. By doing so the graph can then be partitioned into sets of cycles as they are found when tracing the Eulerian circuit.

4)

a) The chromatic number would be 5 because if any pair are bipartite then no two vertices can be the same.
b) This graph is not two colourable because it contains an odd cycle a correct colouring would be 3 coloured.