W4D1 Assignment

Question 1

By applying the law of transitivity to Prob1, Prob2, and Prob3, since Prob1 is polynomial reducible to Prob2, and Prob2 is polynomial reducible to Prob3, we can conclude that Prob1 is polynomial reducible to Prob3.

Question 2



G(V,E) = G(4,4)



K4  (A complete graph of 4 vertices)

G is a subgraph of K4

0

0 1 1 0 



0

A-B-C-D-A = 0+0+0+0 = 0….. cost sum <= k. This solution implies that every edge of C also is an edge in G. Therefore C is a Hamiltonian Cycle in G.

Question 3

To show that TSP is NP-Complete

1. Show TSP is in NP
2. Show TSP is in NP-hard

To show that TSP is in NP, we can show that given a solution (path) to the TSP problem we can verify the solution using a non-deterministic algorithm in polynomial time. This is true.

To show that TSP is NP-hard, we use the given NP-complete problem, i.e HamiltonianCycle problem is NP-Complete.

For the HamiltonianCycle problem to be NP-complete, it is true that the HamiltonianCycle problem is in NP and it is NP-hard.

From the reducibility theorem we know that HC is polynomially reducible to TSP, which makes TSP NP-hard.

Therefore, TSP is NP-complete.