Cpt S 350 Homework #10

Please print your name!

1. Describe a proof that, for any three NP-problems A, B, C, we have $A \leq_m B$ and $B \leq_m C$ implies $A \leq_m C$.

2. Show that the following problem is in NP (that is, you need only describe a nondeterministic polynomial-time algorithm that solves the following problem):

Given: a directed graph G,

Question: is there a path on G such that every node of G is covered exactly once?

3. Show that the following problem is in NP :

Given: a directed graph G,

Question: is there a path on G such that every node of G is covered?

4. Let C be a Boolean circuit (using AND, NOT, OR gates), which has input $(x_1, \cdots, x_n)$ and one output y. The circuit is satisfiable if for some input, the output y produced by C is 1. Suppose that we have a deterministic polynomial time algorithm that decides whether C is satisfiable.

Now, let C_1 and C_2 be two Boolean circuits (using AND, NOT, OR gates), each of which has input $(x_1, \cdots, x_n)$ and one output y. We say that the two circuits are equivalent if for any input, the output produced by C_1 equals the the output produced by C_2.

Show that we also have a deterministic polynomial time algorithm that decides whether C_1 and C_2 are equivalent.