Quiz 2
Theory of Computing, Spring 2009
IIIT-H

February 17, 2009

Please write your answers clearly and concisely. Yours proofs should be up to the point without any unnecessary verbosity.

1. Is the following language L regular? Prove your claim. [5pts]

   $$L = \{ 0^n 1^m \mid n \geq m \text{ and } m \leq 666 \}$$

2. Consider the Pumping Lemma game between Alice and Bob which is discussed in the class. Write a statement expressing what it means for Bob to always have a winning strategy no matter how smart Alice is, using $\forall$ and $\exists$ quantifiers. Show that if Bob always have a winning strategy then the language L in the game is a non-regular language. [5pts]

3. Let $\Sigma = \{ 0, 1, +, = \}$ and [5pts]

   $$\text{ADD} = \{ x = y + z \mid x, y, z \text{ are binary integers, and } x \text{ is the sum of } y \text{ and } z \}.$$

   Show that ADD is not regular.

4. Prove that no infinite subset of $\{ 0^n 1^n \mid n \geq 0 \}$ is regular. [5pts]