**COT 4210 Quiz #2 (3/2/2012)**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1) (20 pts – 2 each) Categorize each of the following languages as either REGULAR (REG), CONTEXT-FREE (CF), TURING DECIDABLE (TD) or TURING RECOGNIZABLE (TR). In order to get credit, you must choose the most strict designation that is accurate. For example, if a language is a Context-Free, but not Regular, the only answer that would be correct would be Context-Free. The alphabet for each language is {0,1}. **Circle the correct answer. If you make 2 circles or more circles for a problem, or your one circle is ambiguous, it will be counted wrong.**

L1 = EQDFA = { <A, B> | A and B are DFAs and L(A) = L(B). } **REG CF TD TR**

L2 = { w | w contains an equal number of 0s and 1s } **REG CF TD TR**

L3 = ELBA = { <M, w> | M is an LBA such that L(M) = $∅$ } **REG CF TD TR**

L4 = ATM = { <M,w> | M is a Turing Machine that accepts w. } **REG CF TD TR**

L5 = HALTTM = { <M,w> | M is a Turing Machine that halts on w. } **REG CF TD TR**

L6 = ADFA = { <B,w> | B is a DFA that accepts w. } **REG CF TD TR**

L7 = { w | w, represented in binary, is a number divisible by 47 } **REG CF TD TR**

L8 = ALBA = { <M, w> | M is an LBA that accepts w } **REG CF TD TR**

L9 = { 0n1n0n | n is a positive integer } **REG CF TD TR**

L10 = ECFG ={ <G> | G is a Context Free Grammar and L(M) = $∅$ } **REG CF TD TR**

2) (20 pts) Define an NICE set of natural integers be defined as follows: If the set is ordered in numerical order x1, x2, x3, … then for all positive integers i, xi | xi+1. For example, the set {2, 6, 12, 48, 240 } is a nice set, since 2 | 6, 6 | 12, 12 | 48 and 48 | 240. (Note that a nice set can be finite or infinite.) Is the number of NICE sets countable? Provide proof of your answer.

3) (10 pts) Let FINITETM = { <M> | M is a Turing Machine such that the number of strings it accepts is finite.} Prove that FINITETM is an undecidable language.