COSC 3340
Examination 3
Wednesday, June 25, 2008, 2 – 3:50 pm
Open Book and Notes

1. Prove that the following language L is not contextfree:

$$L = \{\, 0^i 1^j 2^k \mid i > j > k \geq 1 \,\}.$$

2. Construct a pda $\mathbb{P}$ for the following language:

$$L = \{\, 0^{4i} 1^i \mid i \geq 1 \,\} \text{ where } L = L_f(\mathbb{P}) \text{ (acceptance by final state).}$$

State on which side you write the top of the stack, left: _____| or right |_____ .

Hint: Remove four markers on the stack for every 1.

3. Construct a pda $\mathbb{P}$ that accepts the following language **by empty stack**:

$$L = L(G) \text{ where } G = (T, N, P, S) \text{ with } T = \{<,>,[,]\},$$
$$N = \{S,A\}, \text{ and } P = \{\, S \rightarrow <A>S \mid [A]A \,,\, A \rightarrow [S]A \mid <S>S \mid \varepsilon \,\}.$$

State on which side you write the top of the stack, left: _____| or right |_____ .

Note: You must use the construction "cfg → pda" given in class. Get G into GNF first!

4. Construct a grammar for L(G) for the language N($\mathbb{P}$):

$$\mathbb{P} = (\ \{p,q\}, \{a,b\}, \{Z,X\}, \delta, p, Z, \varnothing\ ) \text{ where the move function } \delta \text{ is given by}$$
$$\delta(p,a,Z) = \{(p,XZ)\}\ 4 \qquad \delta(p,\varepsilon,Z) = \{(p,\varepsilon)\}\ 1 \qquad \delta(p,a,X) = \{(p,XX)\}\ 4$$
$$\delta(q,a,Z) = \{(q,\varepsilon)\}\ 1 \qquad \delta(p,b,X) = \{(q,X)\}\ 2 \qquad \delta(q,b,Z) = \{(p,Z)\}.\ 2$$

Here, the top of the stack is on the left.

5. Construct a Turing machine for the language in Question 1,

$$L = \{\, 0^i 1^j 2^k \mid i > j > k \geq 1 \,\}.$$

Describe first in words what you are doing, then formulate the formal Turing machine.

Points: 1: 20   2: 12   3: 18   4: 30   5: 20