

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 P for the following language:

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

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 P that accepts the following language **by empty stack**:

$$L = L(G) \text{ where } G = (T, N, P, S) \text{ with } T = \{ <, >, [,] \},$$

$$N = \{ S, A \}, \text{ and } P = \{ S \rightarrow <A>S \mid [A]A, A \rightarrow [S]A \mid <S>S \mid \epsilon \}.$$

State on which side you write the top of the stack, left: ☐ or right ☐.
 Note: You must use the construction "cfg \rightarrow pda" given in class. Get G into GNF first!

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

$$P = (\{ p, q \}, \{ a, b \}, \{ Z, X \}, \delta, p, Z, \emptyset) \text{ where the move function } \delta \text{ is given by}$$

$$\delta(p, a, Z) = \{ (p, XZ) \} \quad \delta(p, \epsilon, Z) = \{ (p, \epsilon) \} \quad \delta(p, a, X) = \{ (p, XX) \}$$

$$\delta(q, a, Z) = \{ (q, \epsilon) \} \quad \delta(p, b, X) = \{ (q, X) \} \quad \delta(q, b, Z) = \{ (p, Z) \}.$$

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