CMPE 222 Final Examination
Spring 2017

(20 pts)
1. Pumping lemma states that for every regular language there is a number p such that all strings longer than or equal to p can be pumped (that is to say, they can be written as xyz such that xy^iz is in the language for all $i \geq 0$).

What is p for the regular language described by the following regular expression?

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0(11)*01(00)*
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(40 pts)

2. Consider the language $L = \{\omega \mid \omega = 0^i1^j2^k$ where $i = j$ or $j = k$, $i \geq 0$, $j \geq 0$, $k \geq 0\}$. The alphabet is {0,1,2}.

a) Design a PDA that recognizes L.
b) Write a context-free grammar that describes L.

(40 pts)
3. Consider the context-free grammar G, (where S is the start variable).

```
S → 0A | 0B0 | 0S0
A → S0
B → 1B | 1
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I) Give a verbal description of the language generated by this grammar.

II) Show that this grammar is ambiguous by demonstrating a string that has two distinct leftmost derivations from G.

III) Specify which productions you will drop from this grammar to make it non-ambiguous. Your new grammar should generate the same language, but should not be ambiguous.