CENG 280 - Midterm 2 - Part 3 (20 pts)

A. (5 pts) Write a context-free grammar that generates the language:

$$\{wc^n \mid w \in \{a,b\}^* \ \wedge \ |w| = n \text{ or } |w| = 2n\}$$

B. (15 pts) Prove, by using the strong pumping theorem for CFLs, that the following language is not context-free:

$$L = \left\{a^m b^k c^{(m \times k)} \mid m, k \geq 0\right\}$$

When writing your proof, be clear about what cases you consider, what pumpings you use and what the pumpings generate.

(Hint: To simplify your arguments, try to analyze a small number of generic cases. (Try to see the big picture!) For a simply chosen string, the proof can be finished quickly by analyzing just two cases! Of course, your own proof may use more cases than two. Recall that there are two directions you can pump the strings: up by repeating them or down by removing them.)

Make sure to put your name, student number and signature on your solution.