

# CECS 329 Writing Assignment 5

October 14th, 2021

## Instructions

### Submitting your work

Submit a single file with your solutions to the drop box by Friday, October 15th, 8:00 pm. Make sure you provide your name and SID in the upper-right corner of your solution.

### Late submissions

Should you submit after the dropbox deadline, solutions received no later than 30 minutes after the deadline will lose 20% of the earned points. Solutions received after 30 minutes but before midnight shall lose 50% of the earned points. All other late submissions will not be graded.

## Problems

A. Given the sequence of PDA configuration triples

$$(c, \epsilon, \epsilon), (d, \epsilon, x), (b, \epsilon, xx), (c, 0, x), (d, 1, \epsilon), (d, 1, x), \\ (a, 1, xx), (c, 0, xxx), (d, 1, xx), (b, 0, x), (a, \epsilon, \epsilon),$$

where the first component is the current state, the second is the input symbol that is read, and the third component is the stack contents. Use this sequence to provide a portion of the natural CFG for the associated PDA and use it to derive the word 0111010. (10 pts)

B. Consider the language

$$L = \{x = y + z \mid x, y, z \in \{0, 1\}^+ \text{ and } x + y = z\}.$$

For example  $101 = 11 + 10 \in L$  since

$$(5)_2 = (3)_2 + (2)_2.$$

Use the CFL Pumping Lemma to prove that  $L$  is not a CFL. Hint: you may assume that two binary numbers  $w_1$  and  $w_2$ , each with leading ones, have the same numerical value iff  $w_1 = w_2$ , i.e. iff they both represent the same binary word. This is useful when both sides of the equality symbol are being simultaneously pumped. (10 pts)