

Clayton School of IT  
 CS3322 Programming Languages and Implementation

Assignment 4

Due 5pm Friday 21st of October

The purpose of this assignment is to practice LR parsing.

Consider the following grammar with terminal symbols

$a \ b \ c$

non-terminal symbols  $S, X, Y, A, B$  where  $S$  is the start symbol and productions

$S \rightarrow X c Y$   
 $X \rightarrow A \mid B$   
 $Y \rightarrow A \mid B$   
 $A \rightarrow a a A \mid a a$   
 $B \rightarrow a b B \mid a b$

- (a) Is the language defined by this grammar regular? If so, give an equivalent regular expression that defines the same language. [1 marks]
- (b) Give the canonical collection of LR(0) items for this grammar. (Note: to do this apply exactly the algorithm given in Lecture VIII and use the grammar symbols in the following order:  $\{S, X, Y, A, B, a, b, c\}$ ). [1 marks]
- (c) Fill in the **SLR parsing table** for this grammar in the table below. [2 marks]

STATE	ACTION				GOTO				
	a	b	c	\$	S	X	Y	A	B
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

- (d) Detail how the sentence  $a b c a a$  would be parsed with a LR parser using the tables you gave in (c). For each step of the process give the input, the parser actions (shift/reduce) and stack state in the table below. Note that you may not need all rows. [1 mark]

