Formal Languages and Compilers Theory test September 18, 2020

1. Find a regular expression that represents the language generated by the following grammar:

   G=({A,B,S}, {0,1}, P, S)

   P= { S → 0A | 1B | 0
   A → 0B | 1S
   B → 1B | 0S
   }

Resolve the set of equations

$$\begin{cases} S = 0A \mid 1B \mid 0 \\ A = 0B \mid 1S \\ B = 1B \mid 0S \end{cases}$$

$B = 1^*0S \rightarrow A = 01^*0S \mid 1S$

$\Rightarrow S = 0(01^*0S \mid 1S) \mid 1(1^*0S) \mid 0$

$\Rightarrow S = (001^*0 \mid 01 \mid 11^*0)S \mid 0$

$\Rightarrow S = (001^*0 \mid 01 \mid 11^*0)^*0$

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2. Write a CFG that generates the language $\{ a^n b^m c^n \mid n \geq 0,\ 0 \leq m \leq n \}$.

$S \rightarrow aSc \mid abSc \mid \varepsilon$

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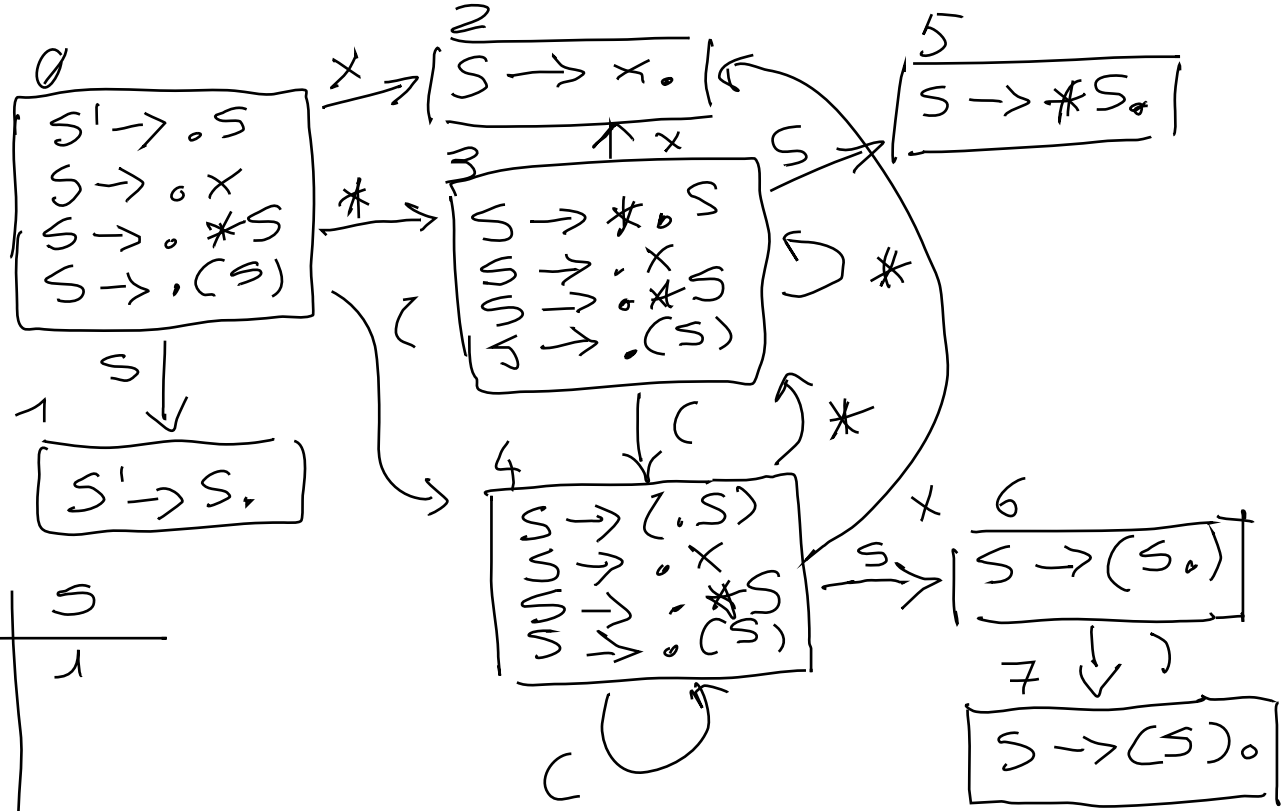
3. Find the LR(0) parsing table for the following grammar and tell if the grammar is LR(0) or not (motivate your answer)

$S \rightarrow x \mid *S \mid (S)$

0 $S' \rightarrow S$
1 $S \rightarrow x$
2 $S \rightarrow *S$
3 $S \rightarrow (S)$



LR(0) parsing table:

	x	*	(	)	$	S
0	s2	s3	s4			1
1					acc	
2	r1	r1	r1	r1	r1	
3	s2	s3	s4			5
4	s2	s3	s4			6
5	r2	r2	r2	r2	r2	
6				s7		
7	r3	r3	r3	r3	r3	

The grammar is LR(0) because the LR(0) parsing table has no conflicts