Homework 3_Solutions

Problem 1 (10pts)

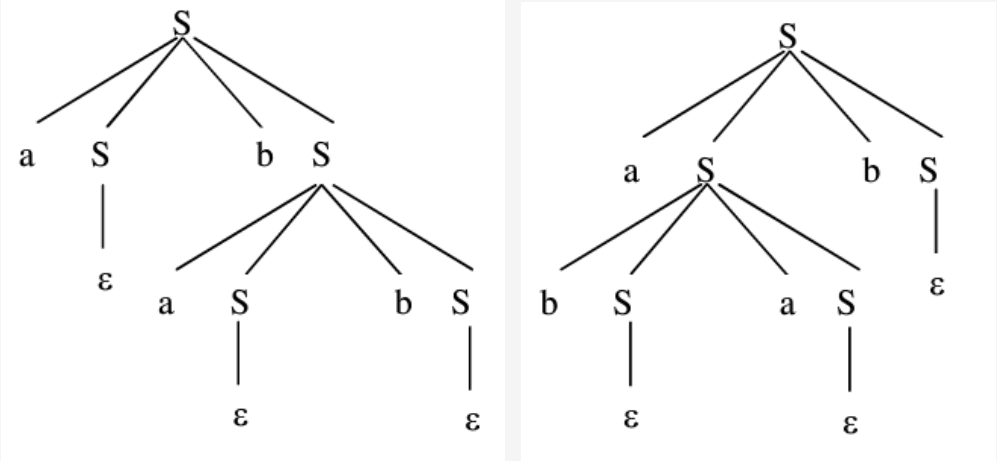
What is ambiguous grammars? Is the following grammar ambiguous? Justify your answer.

S --> aSbS|bSaS|ε

An ambiguous grammar is a context-free grammar for which there exists a string that can have more than one leftmost derivation or parse tree.

S --> aSbS|bSaS|ε is an ambiguous grammar.

For input "abab", there are two parse trees:



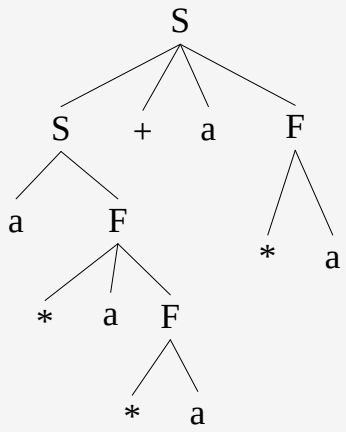
Problem 2 (10pts)

Given the grammar G(S): **S-->S+aF|aF|+aF F-->*aF|*a**

(1) Give the parse tree for the string **a*a*a+a*a**

(2) Give the canonical reduction for the string **a*a*a+a*a**, and the handle of each sentential form at each step.

(1)



(2)

		Handle
a*a*a+a*a	F→*a	*a
a*aF+a*a	F→*aF	*aF
aF+a*a	S→aF	aF
S+a*a	F→*a	*a
S+aF	S→S+aF	S+aF
S		

Problem 3 (15pts)

Given the grammar G[E]: **E --> (L)|a** **L --> L, E | E**

(1) Try to modify the given grammar to LL(1) grammar.

(2) Compute FIRST and FOLLOW of the result grammar.

(3) Construct a predictive parse table for the result grammar.

（1）E → (L)|a　　L→EL’　　L’→,EL’|ε

（2）

	First	Follow
E	{ (, a }	{ $, , ,)}
L	{ (, a }	{) }
L’	{ , ,ε }	{) }

(3)

	(	)	a	,	$
E	E→(L)		E→a		
L	L→EL’		L→EL’		
L’		L’-> ε		L’→EL’	

Problem 4 (15pts)

Given the grammar G[E]: **E --> (L)|a**　　**L --> L, E | E**

(1) Construct LR(0) automaton for G[E]

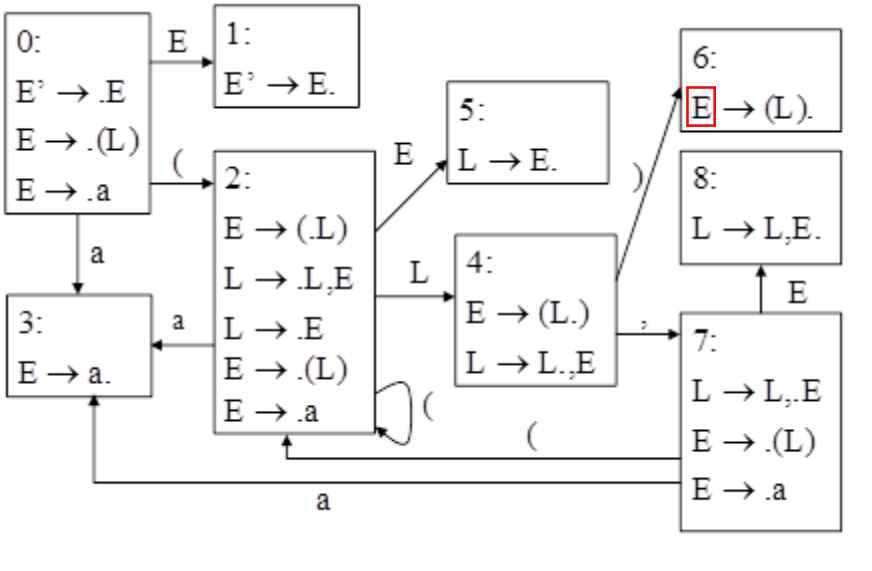
(2) Using the LR(0) automaton to parse the input string **(a, (a, a))** .

(3) Construct SLR(1) parsing table for G[E].

(1)The augmented grammar:

E’ → E　　E → (L)|a　　L → L,E|E

The LR(0) automaton:



(2)

	STACK	SYMBOLS	INPUT
1	0	$	(a,(a,a))$
2	02	$(	a,(a,a))$
3	023	$(a	,(a,a))$
4	025	$(E	,(a,a))$
5	024	$(L	,(a,a))$
6	0247	$(L,	(a,a))$
7	02472	$(L,(	a,a))$
8	024723	$(L,(a	,a))$
9	024725	$(L,(E	,a))$
10	024724	$(L,(L	,a))$
11	0247247	$(L,(L,	a))$
12	02472473	$(L,(L,a	))$
13	02472478	$(L,(L,E	))$
14	024724	$(L,(L	))$

15	0247246	$(L,(L)	)$
16	02478	$(L,E	)$
17	024	$(L	)$
18	0246	$(L)	$
19	01	$E	$

(3)

0:E’ → E 1:E → (L) 2:E → a 3:L → L,E 4:L → E

Follow(E’) = {$} Follow(E)={,,),$} Follow(L)={),,}

State	Action					GoTo	
	a	,	(	)	$	E	L
0	S3		S2			1	
1					acc		
2	S3		S2			5	4
3		r2		r2	r2		
4		S7		S6			
5		r4		r4			
6		r1		r1	r1		
7	S3		S2			8	
8		r3		r3			