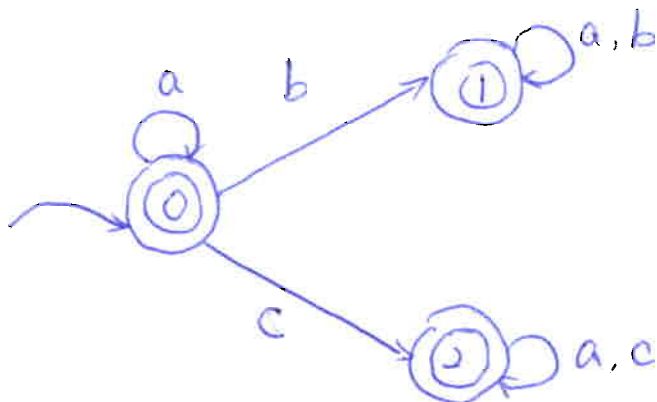




COS 320 Midterm Solution 2007

Problem 1



State 0, 1, 2 are all final states.

Problem 2

$$S \rightarrow aS \mid bB \mid cC \mid \epsilon$$

$$B \rightarrow aB \mid bB \mid \epsilon$$

$$C \rightarrow aC \mid cC \mid \epsilon$$

Problem 3

$$\text{GT exp1: bool}$$

$$\text{GT exp2: tp}$$

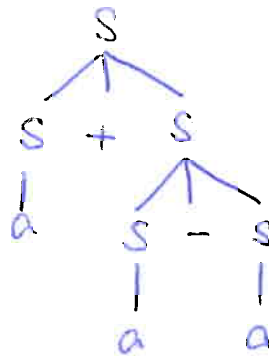
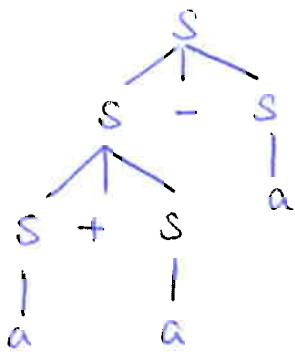
$$\text{GT exp3: tp}$$

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$$\text{GT if exp1 then exp2 else exp3: tp}$$

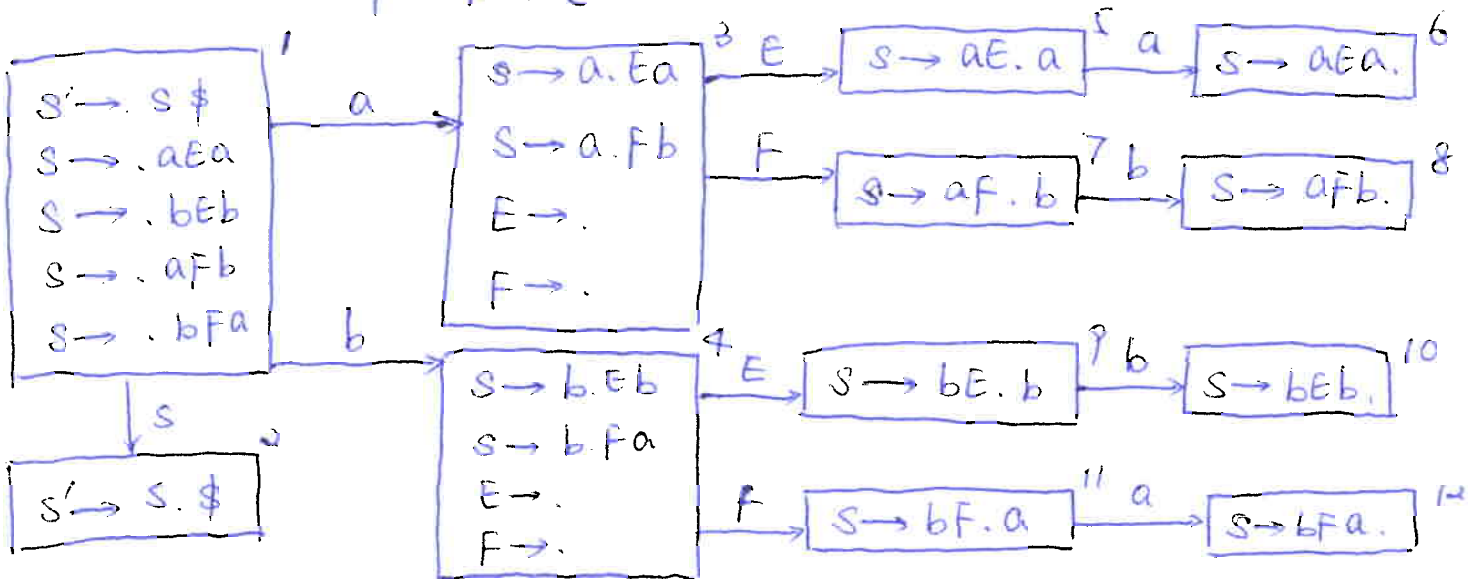


Problem 4  $a+a-a$  is a sentence produced by this grammar.  
 It has two different parse trees.



Problem 5

- 1  $S' \rightarrow S \ \$$
- 2  $S \rightarrow aEa$
- 3  $S \rightarrow bEb$
- 4  $S \rightarrow aFb$
- 5  $S \rightarrow bFa$
- 6  $E \rightarrow \epsilon$
- 7  $F \rightarrow \epsilon$



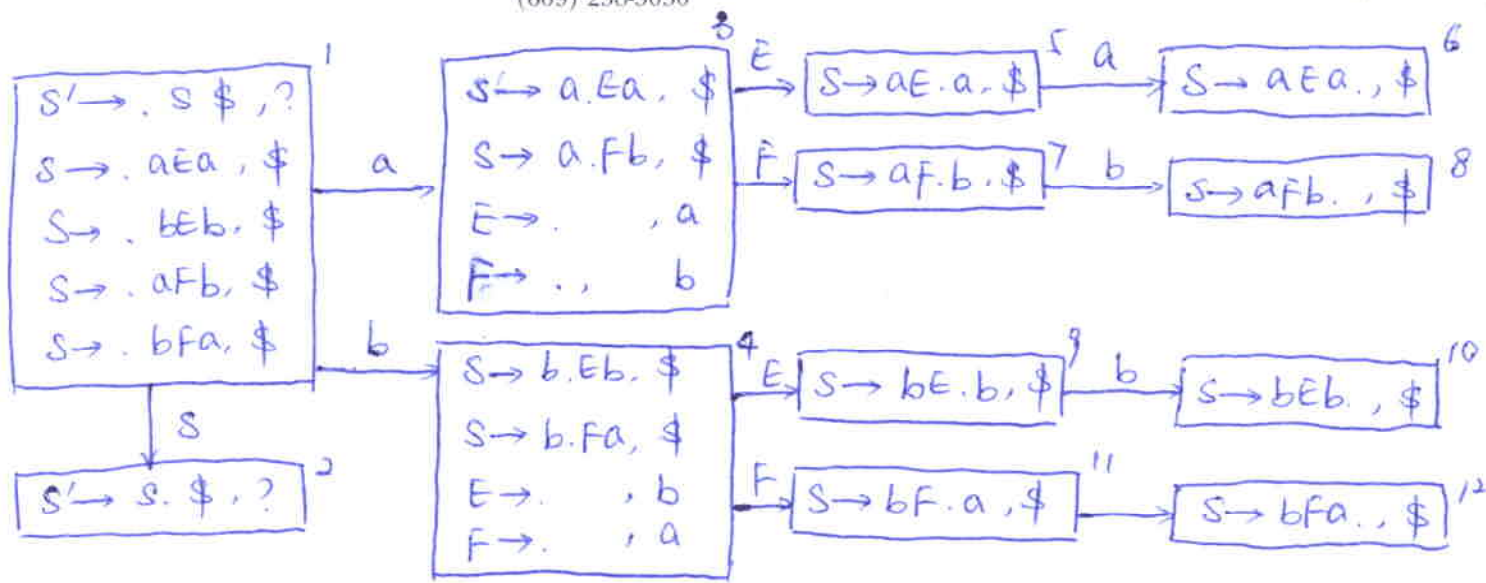


	a	b	\$	S	E	F
1	S3	S4		g2		
2			a			
3	r6/r7	r6/r7	r6/r7		g5	g7
4	r6/r7	r6/r7	r6/r7		g9	g11
5	S6					
6	r2	r2	r2			
7		S8				
8	r4	r4	r4			
9		S10				
10	r3	r3	r3			
11	S12					
12	r5	r5	r5			

There're reduce-reduce conflicts in the parsing table, so this grammar is not in LR(0)

Problem 6

	nullable	FIRST	FOLLOW
S	no	a, b	\$
E	yes		a, b
F	yes		a, b



	a	b	\$	S	E	F
1	S3	S4		S2		
2			a			
3	r6	r7			r5	r7
4	r7	r6			r9	r11
5	S6					
6			r2			
7		S8				
8			r4			
9		S10				
10			r3			
11	S12					
12			r5			

There's no conflict in the parsing table, so this grammar is in LR(1)



Problem 7

	a	b	\$	S	E	F
1	S3	S4		G2		
2			a			
3	r6/r7	r6/r7			G5	G7
4	r6/r7	r6/r7			G9	G10
5	S6					
6			r2			
7		S8				
8			r4			
9		S10				
10			r3			
11	S12					
12			r5			

There're still conflicts in the parsing table, so this grammar is not in SLR(1).

Problem 8 We can't find identical states with the lookahead sets ignored, so we can't combine any states. The LALR(1) state graph and parsing table are exactly the same as those of LR(1). So no conflicts. The grammar is in LALR(1).



Problem 4

	a	b	\$
$S'$	$S' \rightarrow S \ \$$	$S' \rightarrow S \ \$$	
$S$	$S \rightarrow aEa / S \rightarrow aFb$	$S \rightarrow bEb / S \rightarrow bFa$	
$E$	$E \rightarrow \epsilon$	$E \rightarrow \epsilon$	
$F$	$F \rightarrow \epsilon$	$F \rightarrow \epsilon$	

There're conflicts in the parsing table. So the grammar is not in LL(1).