CS 3342 - ASN 1

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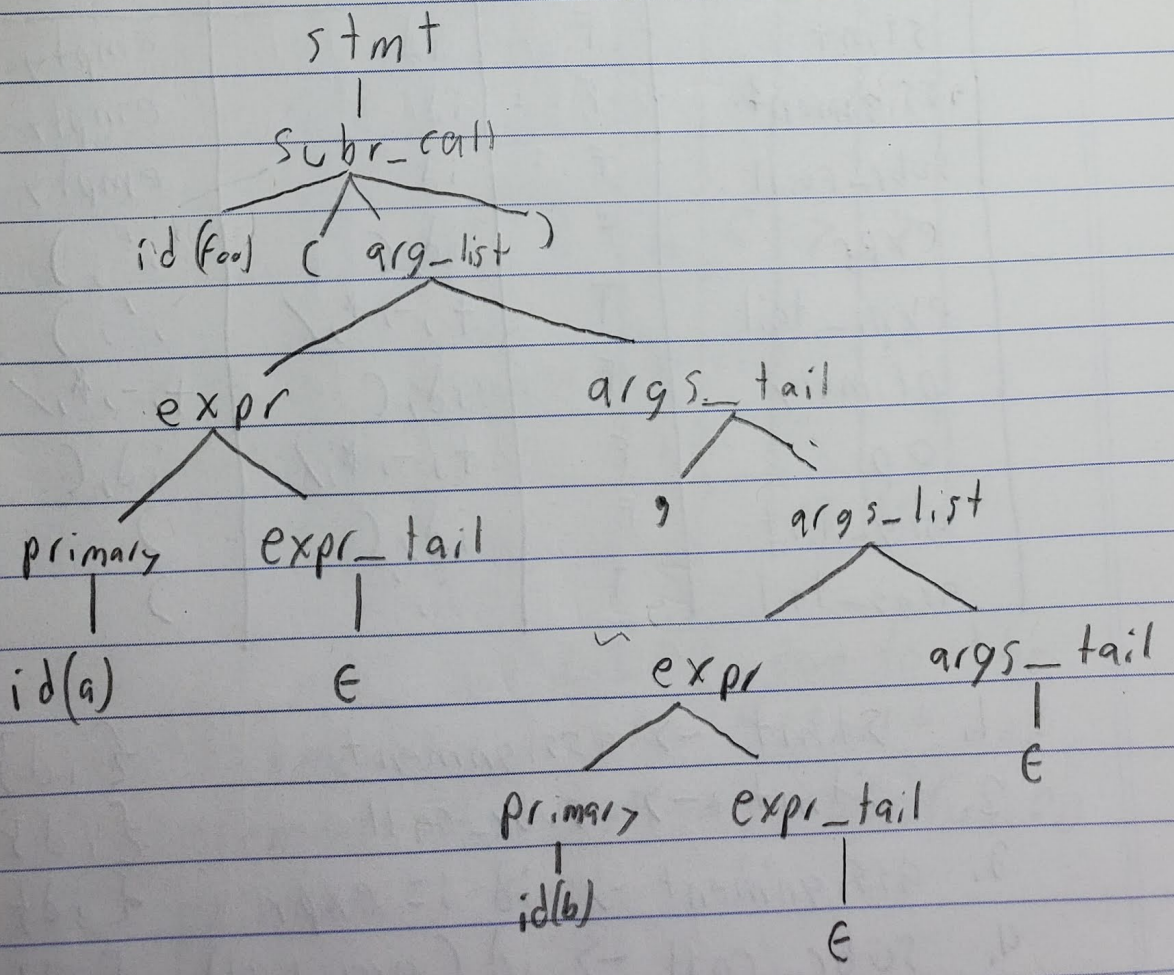
1a) "(¬(", ENTER)|(\ENTER))*"

- strings have to start and end with "
- can have any char except from the set {" and ENTER}
  or can be \" or \ENTER

b) ([A-Za-z] ¬(File, For, from))*

- Strings can have any combo of upper and lower case except for the words for, from file

2a)



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b) stmt -> subr_call
-> id (args_list)
-> id (expr args_tail)
-> id (expr, args_list)
-> id (expr, expr args_tail)
-> id (expr, expr)
-> id (expr, primary expr_tail)
-> id (expr, primary)
-> id (expr, id)
-> id (primary expr_tail, id)
-> id (primary, id)
-> id (id, id)

c)

	EPS	First-set	Follow-set
stmt	F	id	empty
assignment	F	id	empty
subr_call	F	id	empty
expr	F	id, (	;, ,)
expr_tail	T	+, -, *, /	;, ,)
primary	F	id, (	+, -, *, /
op	F	+, -, *, /	id, (
arg_list	F	id, (	)
args_tail	T	,	)

1. stmt -> assignment {id}
2. stmt -> subr_call {id}
3. assignment -> id := expr {id}
4. subr_call -> id (arg_list) {id}

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5.	expr -> primary expr_tail	{id, (}
6.	expr_tail -> op expr	{+, -, *, /}
7.	expr_tail -> ∈	{;,)}
8.	primary -> id	{id}
9.	primary -> subr_call	{id}
10.	primary -> (expr)	{(}
11.	op -> + | - | * | /	{+, -, *, /}
12.	arg_list -> expr args_tail	{id, (}
13.	args_tail -> , arg_list	{,}
14.	args_tail -> ∈	{)}

Parser table

	id	:=	(	+	-	*	/	,	)
stmt	1,2								
assignment	3								
subr_call	4								
expr	5		5						
expr_tail	-			6	6	6	6	7	7
primary	8,9		10						
op	-			11	11	11	11		
args_list	12		12						
args_tail	-							13	14

Grammer is not in LL(1) due to the confusion regarding the "stmt" and "id" statements. As well as confusion of "primary" and "id"

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d) Factor out "id" from productions with "stmt" and "expr"

stmt → id stmt_tail
stmt_tail → := expr
stmt_tail → (arg_list)
expr → primary expr_tail
expr_tail → op expr
expr_tail → ϵ
primary → id primary_tail
primary_tail → ϵ
primary_tail → (args_list)
primary → (expr)
op → + | - | * | /
args_list → expr args_tail
args_tail → , arg_list
args_tail → ϵ

3a i) since $\bar{E}_s$ expands to ϵ
∴ EPS($\bar{E}_s$) = true

ii) First($\bar{E}_s$)
for $\bar{E}_s \rightarrow \bar{E}\ \bar{E}_s$
FIRST($\bar{E}_s$) ≐ FIRST($\bar{E}$)
for $\bar{E}$ → atom
FIRST($\bar{E}$) = atom
for $\bar{E} \rightarrow$ '$\bar{E}$
FIRST($\bar{E}$) = '

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for $\bar{E} \rightarrow (\bar{E}\ \bar{E}s)$

$FIRST(\bar{E}) = ($

for $\bar{E}s \rightarrow \epsilon$

$FIRST(\bar{E}s) = \epsilon$

$\therefore FIRST(\bar{E}s) = \{atom, ', (, \epsilon\}$

iii) $Follow(\bar{E})$

for $\bar{E} \rightarrow \bar{E}\ \$\$$

$Follow(\bar{E}) = \$\$$

for $\bar{E} \rightarrow 'E$

$follow(\bar{E}) = Follow(E)$

for $\bar{E} \rightarrow (E\ Es)$

$Follow(\bar{E}) = First(Es) = atom, (, '$

$follow(E) = follow(\bar{E})$

for $\bar{E}s \rightarrow \bar{E}\ \bar{E}s$

$follow(\bar{E}) = follow(\bar{E}s)$

$follow(\bar{E}) = First(\bar{E}s) = atom, (, '$

for $E \rightarrow (\bar{E}\ \bar{E}s)$

$follow(\bar{E}s) = First()) =)$

For $\bar{E}s \rightarrow \bar{E}\ \bar{E}s$

$follow(\bar{E}s) = Follow(\bar{E}s) =)$

$\therefore Follow(\bar{E}) = \{\$\$, atom, ', (,)\}$

iv) $Predict(\bar{E}s \rightarrow \epsilon) = \{\ )\}$

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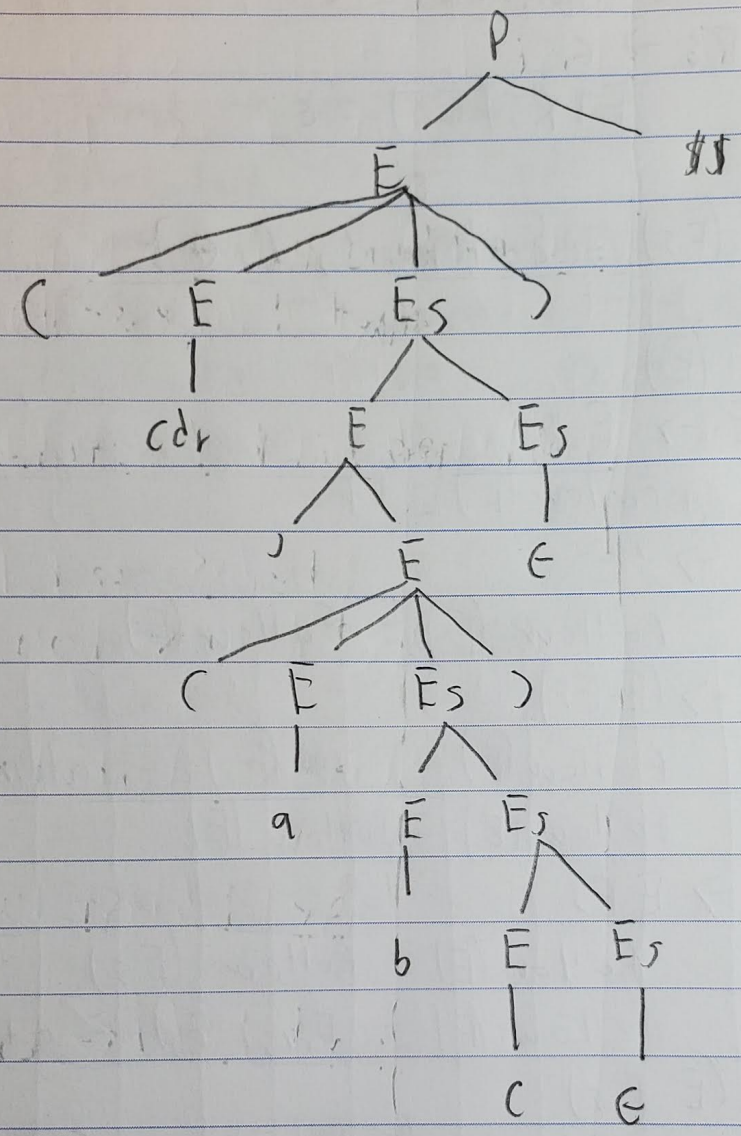
3 b) Parse tree for (cdr '(a,b,C)) $$



C) P → E $$
→ (E Es) $$
→ (cdr Es) $$
→ (cdr E Es) $$
→ (cdr '(E Es) Es) $$
→ (cdr '(a Es) Es) $$
→ (cdr '(a E Es) Es) $$
→ (cdr '(a b Es) Es) $$
→ (cdr '(a b E Es) Es) $$

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→ (cdr '(a b c Es) Es) $$
→ (cdr '(a b c) Es) $$
→ (cdr '(a b c)) $$

d)

Parse stack	input stream	comment
P	(cdr '(a b c)) $$	
E $ $	(cdr '(a b c)) $$	predict P → E $ $
(E Es) $ $	(cdr '(a b c)) $$	predict E → (E Es)
E Es) $ $	cdr '(a b c)) $$	match (
atom Es) $ $	cdr '(a b c)) $ $	predict E → atom
Es) $ $	'(a b c)) $ $	match atom
E Es) $ $	'(a b c)) $ $	predict Es → E Es
' E Es) $ $	'(a b c)) $ $	predict E → ' E
E Es) $ $	(a b c)) $ $	match '
(E Es) Es) $ $	(a b c)) $ $	predict E → (E, Es)
E Es) Es) $ $	a b c)) $ $	match (
atom Es) Es) $ $	a b c)) $ $	predict E → atom
Es) Es) $ $	b c)) $ $	match atom
E Es) Es) $ $	b c)) $ $	predict Es → E Es
atom Es) Es) $ $	b c)) $ $	predict E → atom
Es) Es) $ $	c)) $ $	match atom
E Es) Es) $ $	c)) $ $	predict Es → E Es
atom Es) Es) $ $	c)) $ $	predict E → atom
Es) Es) $ $	)) $ $	match atom
) Es) $ $	)) $ $	predict Es → ϵ
Es) $ $	) $ $	match)
) $ $	) $ $	predict Es → ϵ
$ $	$ $	match)

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	4. State	Transition
0.	decl_list -> decl_list ; | decl ; decl -> • id ; type	on decl_list shift (push 0) goto 1 on id shift goto 6
1.	decl_list -> decl_list • decl ; | decl ; decl -> • id ; type	on decl_list shift goto 2 on id shift goto 6
2.	decl_list -> decl_list decl • ; decl	on ; shift goto 3
3.	decl_list -> • decl ; decl -> • id ; type	on decl shift goto 4 on id shift goto 6
4.	decl_list -> decl • ;	on decl shift goto 5
5.	decl -> • id ; type	on id shift goto 6
6.	decl -> id • ; type	on ; shift goto 7
7.	decl -> id ; • type type -> • int type -> • real type -> • char type -> • array	on type shift and reduce on int shift and reduce on real shift and reduce on char shift and reduce on array shift and reduce

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