

# Sample Solution

CSCI 3136

Assignment 4

(a)

$RE \rightarrow Exp \$$

$Exp \rightarrow Seq Alt$

$Alt \rightarrow \epsilon$

$Alt \rightarrow | Exp$

$Seq \rightarrow \epsilon$

$Seq \rightarrow Part Seq$

$Part \rightarrow Atom Rep$

$Atom \rightarrow .$

$Atom \rightarrow char$

$Atom \rightarrow ( Exp )$

$Rep \rightarrow \epsilon$

$Rep \rightarrow *$

$Rep \rightarrow +$

$Rep \rightarrow ?$



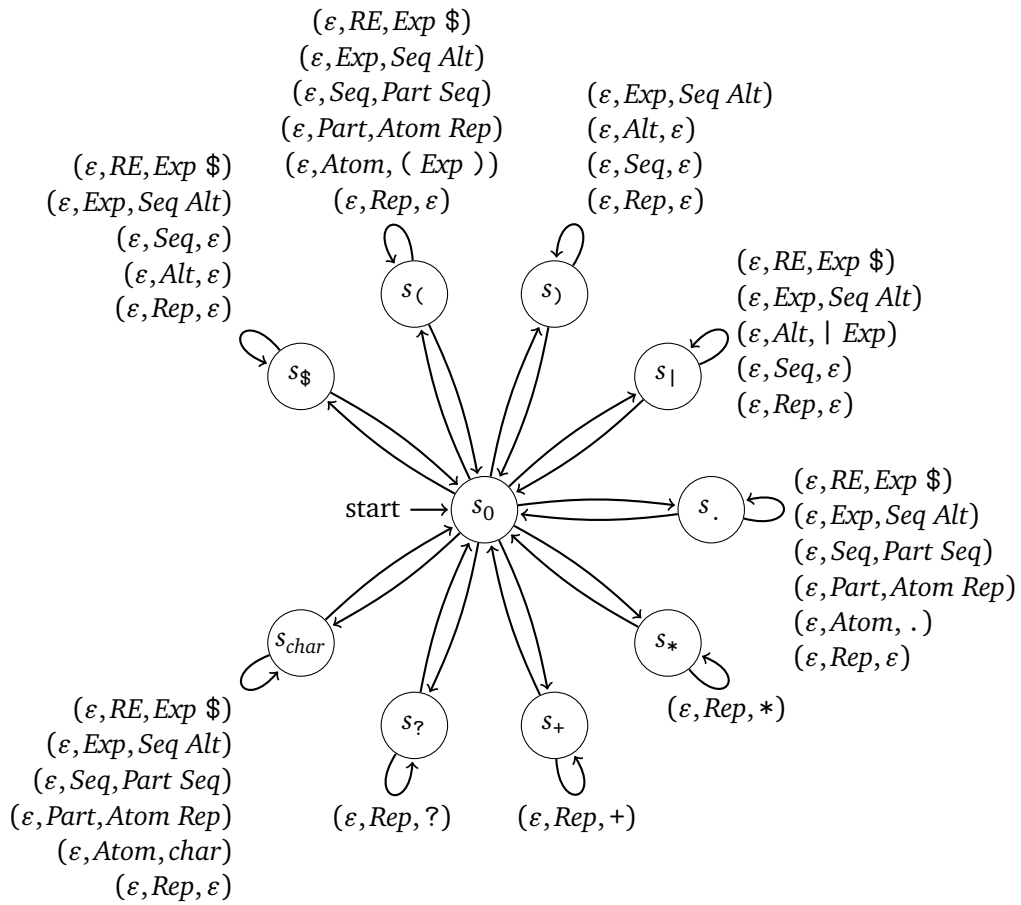
(c)

Symbol $X$	FIRST( $X$ )	Non-terminal $X$	FOLLOW( $X$ )
\$	{ $\$$ }	$RE$	{ $\epsilon$ }
(	{(}	$Exp$	{ $\$, )$ }
)	{)}	$Alt$	{ $\$, )$ }
	{ }	$Seq$	{ $\$, ),  $ }
.	{.}	$Part$	{ $\$, (, ), ., char,  $ }
*	{*}	$Atom$	{ $\$, (, ), *, +, ., ?, char,  $ }
+	{+}	$Rep$	{ $\$, (, ), ., char,  $ }
?	{?}		
$char$	{ $char$ }		
$RE$	{ $\$, (, ., char,  $ }		
$Exp$	{(, ., $char,  , \epsilon$ }		
$Alt$	{ , $\epsilon$ }		
$Seq$	{(, ., $char, \epsilon$ }		
$Part$	{(, ., $char$ }		
$Atom$	{(, ., $char$ }		
$Rep$	{*, +, ?, $\epsilon$ }		

Production $R$	PREDICT( $R$ )
$RE \rightarrow Exp \$$	{ $\$, (, ., char,  $ }
$Exp \rightarrow Seq Alt$	{ $\$, (, ), ., char,  $ }
$Alt \rightarrow \epsilon$	{ $\$, )$ }
$Alt \rightarrow   Exp$	{ }
$Seq \rightarrow \epsilon$	{ $\$, ),  $ }
$Seq \rightarrow Part Seq$	{(, ., $char$ }
$Part \rightarrow Atom Rep$	{(, ., $char$ }
$Atom \rightarrow .$	{.}
$Atom \rightarrow char$	{ $char$ }
$Atom \rightarrow ( Exp )$	{(}
$Rep \rightarrow \epsilon$	{ $\$, (, ), ., char,  $ }
$Rep \rightarrow *$	{*}
$Rep \rightarrow +$	{+}
$Rep \rightarrow ?$	{?}

This proves that the grammar is LL(1) because the productions for each non-terminal have disjoint PREDICT sets.

(d)



The labelling of the edges between the start state  $s_0$  and the states  $s_t$  for  $t \in \{ \$, (, ), |, ., *, +, ?, char \}$  are not shown. For all  $t \in \{ \$, (, ), |, ., *, +, ?, char \}$ , the edge  $(s_0, s_t)$  is labelled  $(t, \epsilon, \epsilon)$  and the edge  $(s_t, s_0)$  is labelled  $(\epsilon, t, \epsilon)$ .