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CMPT432 - Design of Compilers
Lab 9

1. [***Crafting a Compiler* - Exercise 5.5**] Transform the following grammar into LL(1) form using the techniques presented in Section 5.5:

```
1  DeclList       → DeclList ; Decl
2                 | Decl
3  Decl           → IdList : Type
4  IdList         → IdList , id
5                 | id
6  Type           → ScalarType
7                 | array ( ScalarTypeList ) of Type
8  ScalarType     → id
9                 | Bound .. Bound
10 Bound          → Sign intconstant
11                | id
12 Sign           → +
13                | −
14                | λ
15 ScalarTypelist → ScalarTypeList , ScalarType
16                | ScalarType
```

```
1   DeclList        --> Decl ; DeclList
2                    |  [delta]
3   Decl            --> IdList : Type
4   IdList          --> id , IdList
5                    |  [delta]
6   Type            --> ScalarType
7                    |  array ( ScalarTypeList ) of Type
8   ScalarType      --> id
9                    |  Bound . . Bound
10  Bound           --> Sign intconstant
11                   |  id
12  Sign            --> +
13                   |  -
14                   |  [delta]
15  ScalarTypeList  --> ScalarType , ScalarTypeList
16                   |  [delta]
```

2. [***"Dragon" Textbook* - Exercise 4.5.3**] Give bottom-up parses for the following input strings and grammars:

   (a) The input 000111 according to the grammar $S \rightarrow 0\ S\ 1 \mid 0\ 1$

Input	Stack	Action
000111$	ε	shift
00111$	0	shift
0111$	00	shift
111$	000	shift
11$	1000	reduce by S --> 01
11$	S00	shift
1$	1S00	reduce by S --> 0S1
1$	0	shift
$	10	reduce by S --> 01
$	S	accept

   (b) The input aaa * a + + according to the grammar $S \rightarrow S\ S\ + \mid S\ S\ * \mid a$

Input	Stack	Action
aaa*a++$	ε	shift
aa*a++$	a	reduce by S --> a
aa*a++$	S	shift
a*a++$	aS	reduce by S --> a
a*a++$	SS	shift
*a++$	aSS	reduce by S --> a
*a++$	SSS	shift
a++$	*SSS	reduce by S --> SS*
a++$	SS	shift
++$	aSS	reduce by S --> a
++$	SSS	shift
+$	+SSS	reduce by S --> SS+
+$	SS	shift
$	+SS	reduce by S --> SS+
$	S	accept