

Crafting A Compiler:

Do exercises 4.9, 5.10

9. Compute First and Follow sets for the nonterminals of the following grammar.

```

1  S → a S e
2    | B
3  B → b B e
4    | C
5  C → c C e
6    | d

```

4.9:

non-terminals

First	Follow
$First(S) \supseteq First(B)$	$Follow(S) \subseteq Follow(B)$
$First(B) \supseteq First(C)$	$Follow(B) \subseteq Follow(C)$
$First(C) = \{c, d\}$	$Follow(S) = \{\$, e\}$
$First(B) = \{b, c, d\}$	$Follow(B) = \{\$, e\}$
$First(S) = \{a, b, c, d\}$	$Follow(C) = \{\$, e\}$

10. Show the two distinct parse trees that can be constructed for

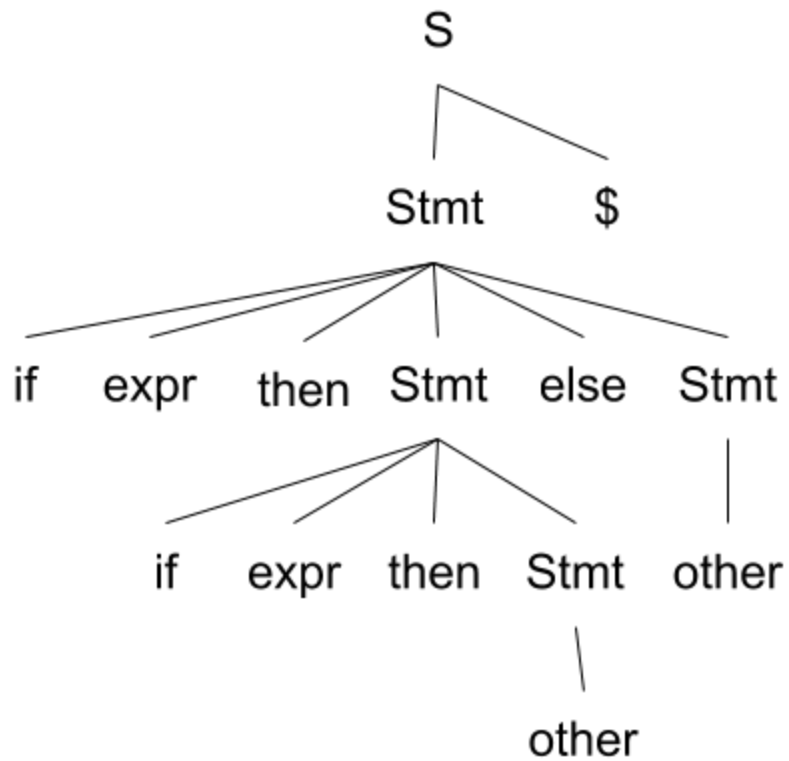
if expr then if expr then other else other

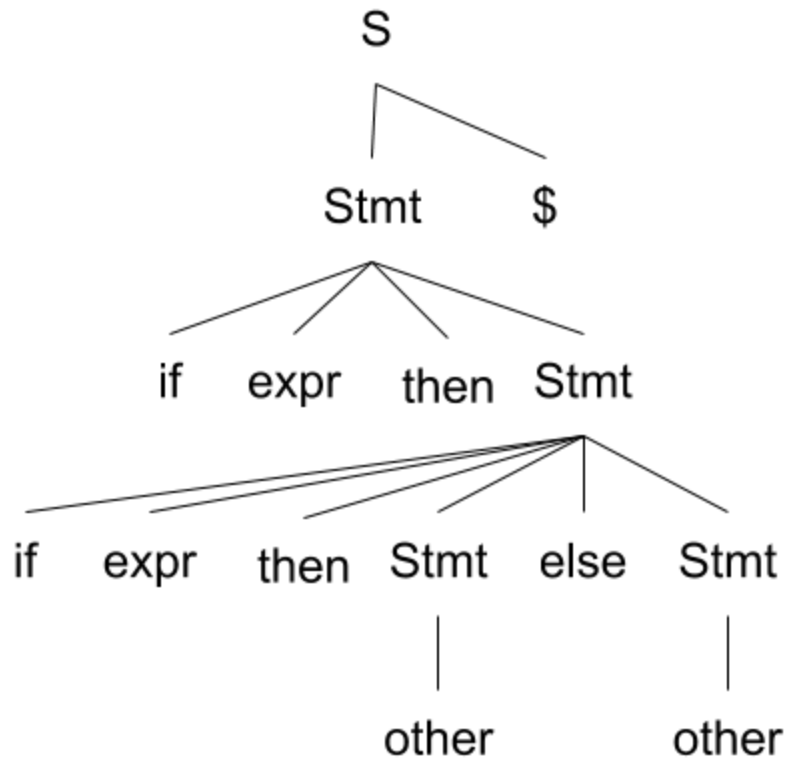
using the grammar given in Figure 5.17. For each parse tree, explain the correspondence of then and else.

- 1 $S \rightarrow \text{Stmt } \$$
- 2 $\text{Stmt} \rightarrow \text{if expr then Stmt else Stmt}$
- 3 $\mid \text{if expr then Stmt}$
- 4 $\mid \text{other}$

Figure 5.17: Grammar for if-then-else.

5.10:





Dragon:

Do exercise 4.4.3

Exercise 4.2.1: Consider the context-free grammar:

$$S \rightarrow S S + \mid S S * \mid a$$

and the string $aa + a*$.

Exercise 4.4.3: Compute FIRST and FOLLOW for the grammar of Exercise 4.2.1.

First:

Non-terminal	Terminals
$First(S) = \{a, \$\}$	$First(a) = \{a\}$
	$First(+) = \{+\}$
	$First(*) = \{*\}$

Follow:

Non-terminal	Terminals
$Follow(S) = \{+, *, a, \$\}$	$Follow(a) = \{+, *, a, \$\}$
	$Follow(+)= \{+, *, a, \$\}$
	$Follow(*) = \{+, *, a, \$\}$