Formal Languages and Compilers
Lab V: Semantics

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Formal Languages and Compilers — BSc course

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Board

Production	Semantic Rules
$Prog \rightarrow S$	$S.next := newlabel; Prog.code := S.code \parallel gen(S.next\ ':')$
$S \rightarrow S_1\ ;\ S_2$	$S_1.next := newlabel; S_2.next := S.next;$
	$S.code := S_1.code \parallel gen(S_1.next\ ':') \parallel S_2.code$
$S \rightarrow$ while $Test$ do $\{S_1\}$	$Test.begin := newlabel;\ \ Test.true := newlabel;$
	$Test.false := S.next;\ \ S_1.next := Test.begin;$
	$S.code := gen(Test.begin\ ':') \parallel Test.code \parallel gen(Test.true\ ':') \parallel$
	$S_1.code \parallel gen('\text{goto}'\ \ Test.begin)$
$S \rightarrow \text{id} := E$	$S.code := E.code \parallel gen(\text{id}.place\ ':='\ \ E.place)$
$Test \rightarrow \text{id}_1\ \ \leq\ \ \text{id}_2$	$Test.code := gen('\text{if}'\ \text{id}_1.place\ '\leq'\ \text{id}_2.place\ '\text{goto}'\ \ Test.true) \parallel$
	$gen('\text{goto}'\ \ Test.false)$
$E \rightarrow E_1 + \text{id}$	$E.place := newtemp;$
	$E.code := E_1.code \parallel gen(E.place\ ':='\ \ E_1.place\ '+'\ \ \text{id}.place)$
$E \rightarrow \text{id}$	$E.place := \text{id}.place; E.code :=' \ '$

Board

Given the input:

```
w := a + b;
while w ≤ z do {
        z := z + a}
```

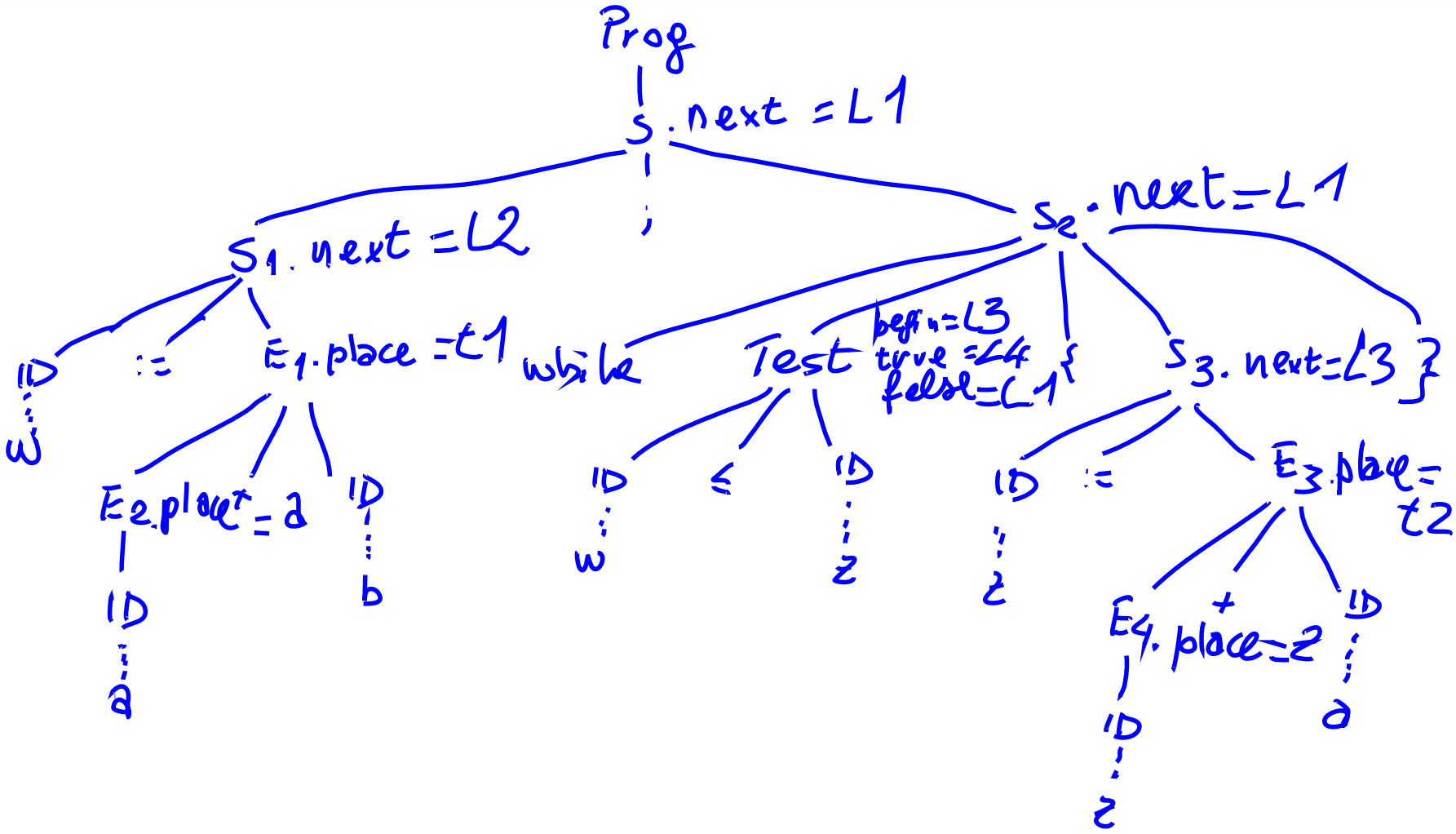
Show the following:

1. The annotated parse tree for the input together with the values of the attributes (without the *code* attribute).
2. The three-address code produced computed for the given input.
3. Considering the production

$$S \rightarrow \text{while } \mathit{Test} \text{ do } \{S_1\}$$

show what are the synthesized attributes and what are the inherited attributes (mark with **s** the synthesized and with **h** the inherited attributes in the above semantic rules), and show the corresponding Translation Scheme.

Board


Prog
S.next = L1
S1.next = L2
;
S2.next = L1
ID
:=
E1.place = t1
while
Test
begin = L3
true = L4
false = L1
{
S3.next = L3
}
ID
E2.place = a
ID
w
≤
ID
z
ID
:=
E3.place = t2
a
b
E4.place = z
+
ID
z
a

Board

$E_2.code$ = ''

$E_1.code$ = $t1 := a + b$

$S_1.code$ = $t1 := a + b$
$w := t1$

$Test.code$ = if $w \leq z$ goto L4
goto L1

$E_4.code$ = ''

$E_3.code$ = $t2 := z + d$

$S_3.code$ = $t2 := z + d$
$z := t2$

$S_2.code$ =
L3: if $w \leq z$ goto L4
goto L1
L4: $t2 := z + d$
$z := t2$
goto L3

$Prog.code$ =
$t1 := a + b$
$w := t1$
L2:L3: if $w \leq z$ goto L4
goto L1
L4: $t2 := z + d$
$z := t2$
goto L3
L1: