



南方科技大学

SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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COMPILER @Liu Yepang 2019

for SUSTech CSE

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HOMEWORK 4

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2019  
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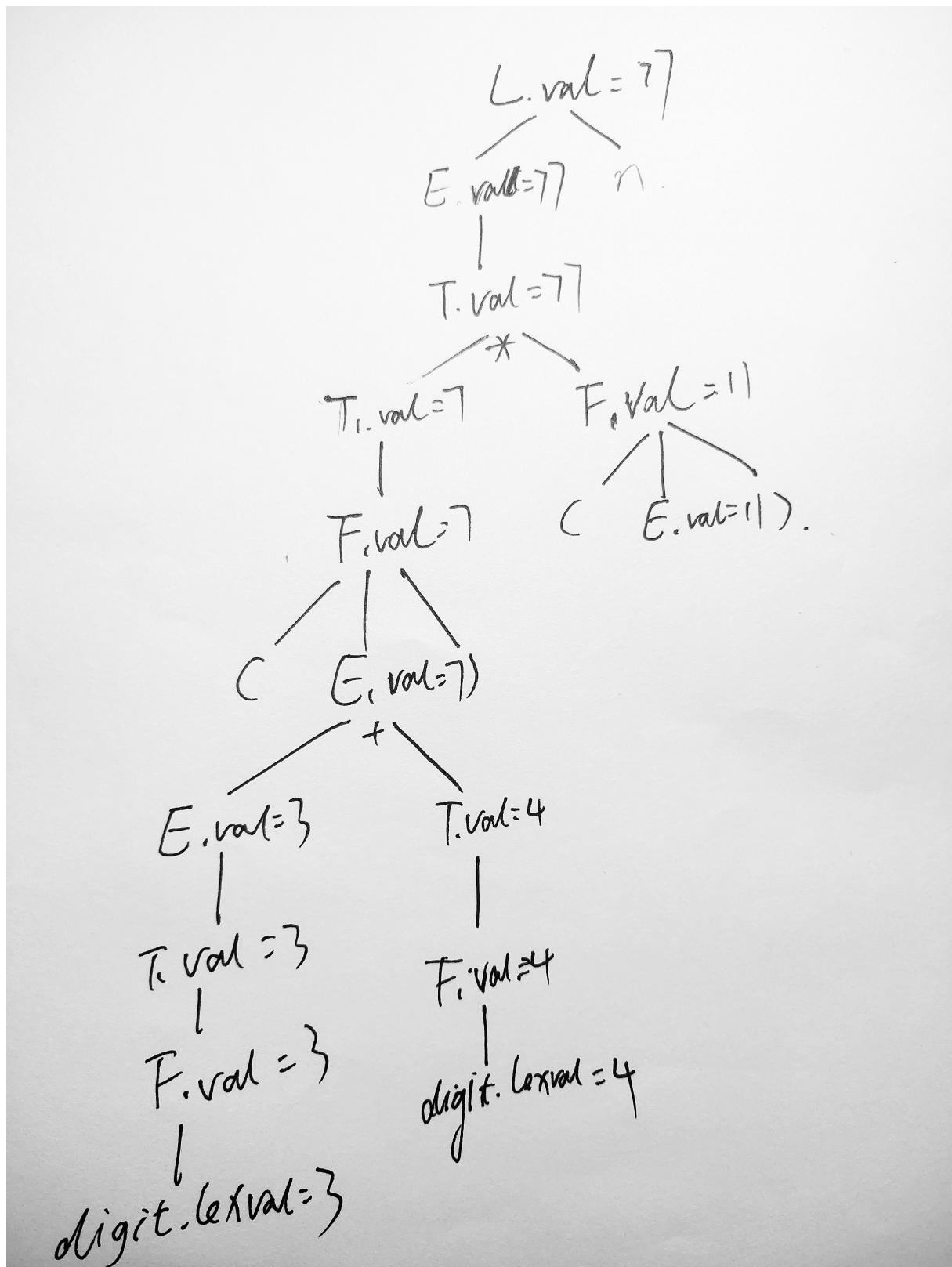
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# 1 Exercise 1: For the SDD in Figure 1, give annotated parse trees for the following expressions:

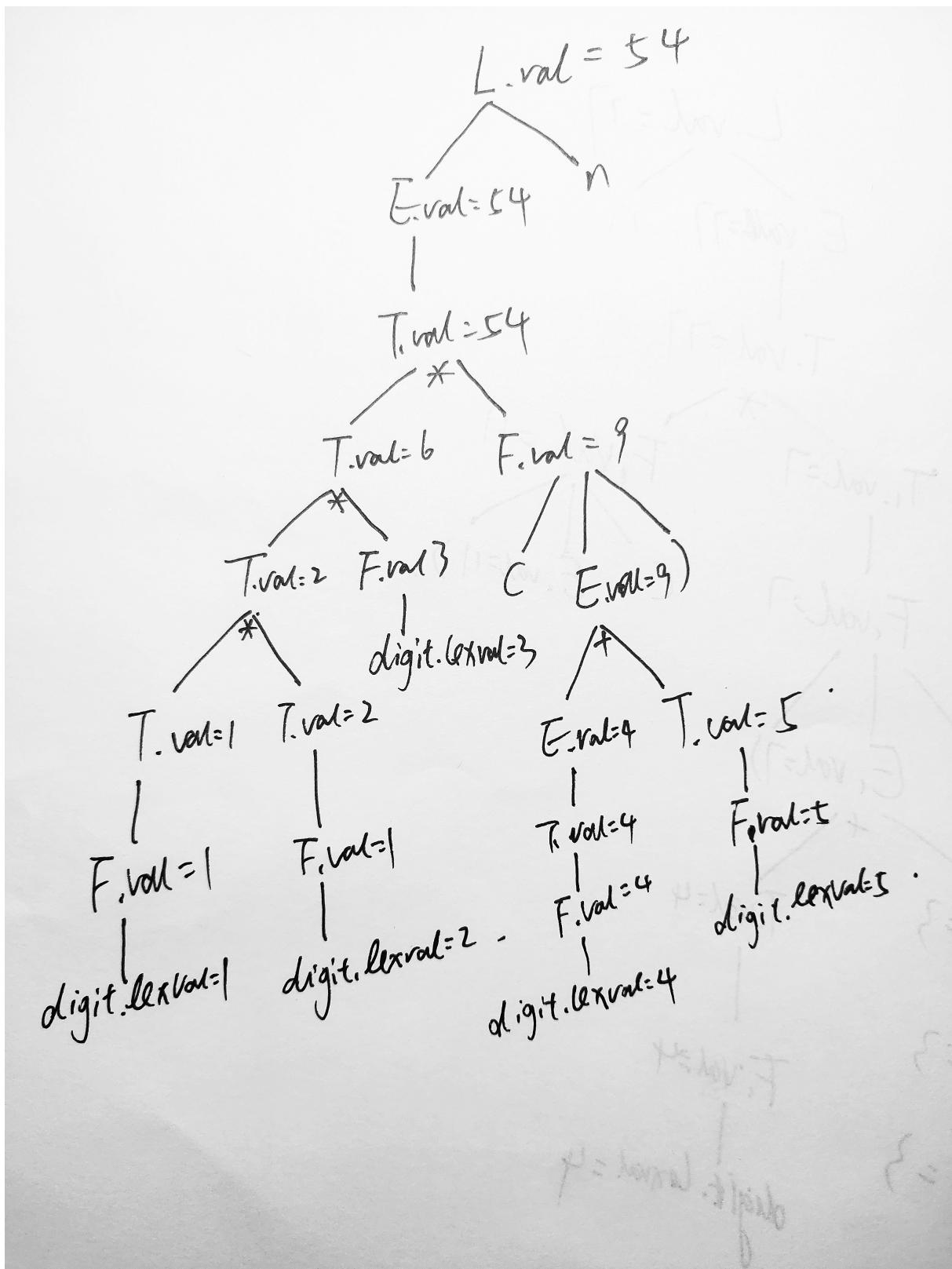
图 1: Syntax-directed definition of a simple desk calculator

PRODUCTION		SEMANTIC RULES
1)	$L \rightarrow E \text{ n}$	$L.val = E.val$
2)	$E \rightarrow E_1 + T$	$E.val = E_1.val + T.val$
3)	$E \rightarrow T$	$E.val = T.val$
4)	$T \rightarrow T_1 * F$	$T.val = T_1.val \times F.val$
5)	$T \rightarrow F$	$T.val = F.val$
6)	$F \rightarrow ( E )$	$F.val = E.val$
7)	$F \rightarrow \text{digit}$	$F.val = \text{digit.lexval}$

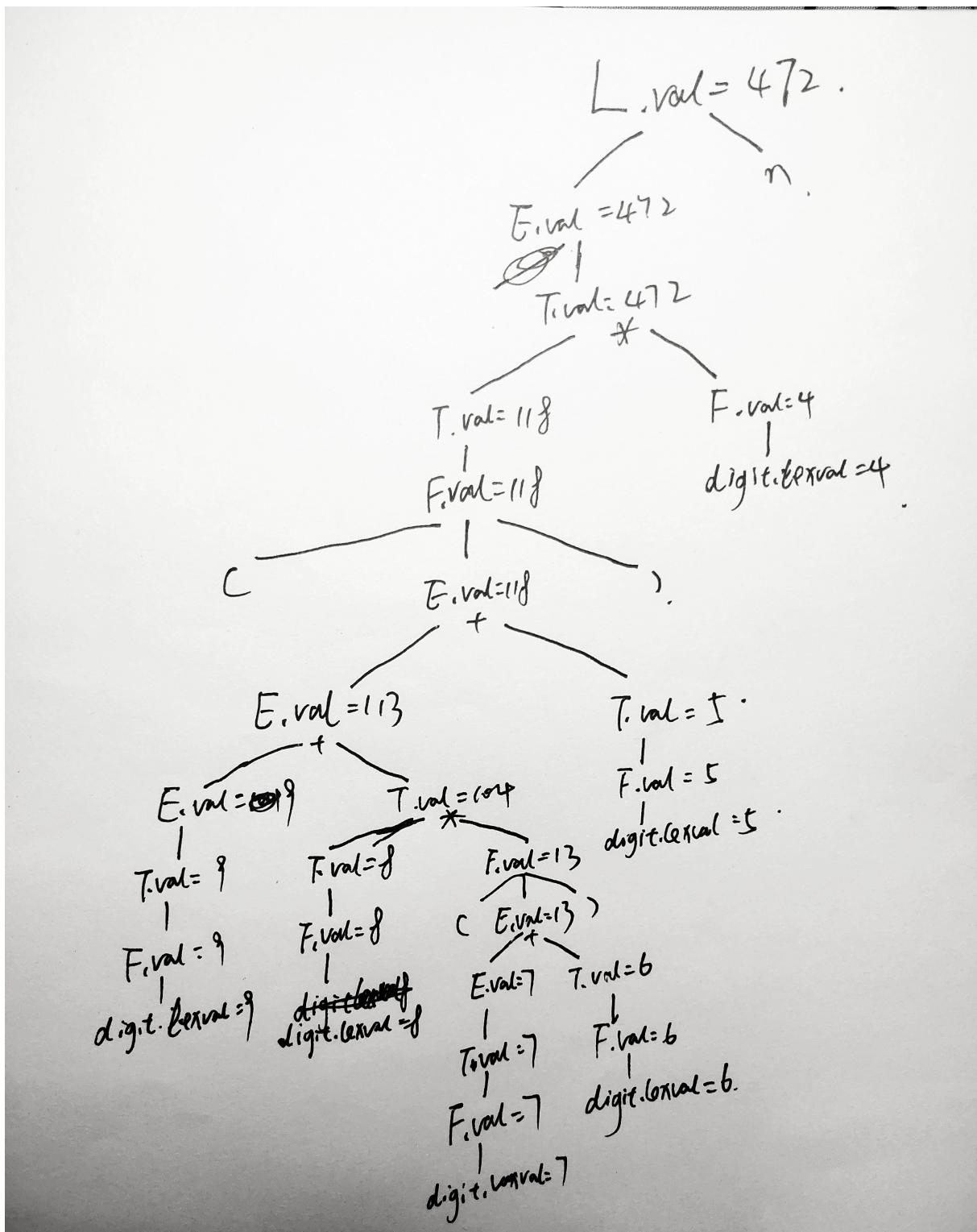
1.1  $(3 + 4) * (5 + 6)n$  [20 points]



1.2  $1 * 2 * 3 * (4 + 5)n$  [20 points]

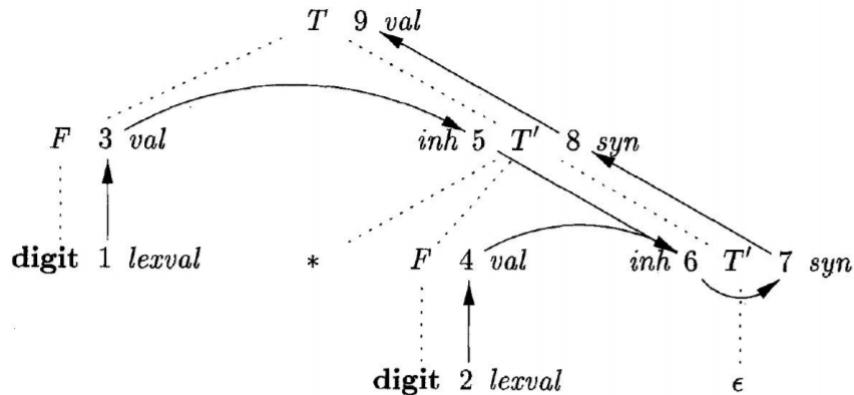


1.3  $(9 + 8 * (7 + 6) + 5) * 4n$  [20 points]



2 Exercise 2: What are all the topological sorts for the dependency graph of Figure 2? One sort mentioned during lecture is 1, 2, 3, . . . , 9 (slide #16 of Chapter 4). [20 points]

图 2: A dependency graph



The sequence must end with 6,7,8,9 and it can start with 1 or 2. So all the topological sorts of the dependency graph is:

- 2,4,1,3,5,6,7,8,9
- 2,1,4,3,5,6,7,8,9
- 2,1,3,4,5,6,7,8,9
- 2,1,3,5,4,6,7,8,9
- 1,2,4,3,5,6,7,8,9
- 1,2,3,4,5,6,7,8,9
- 1,2,3,5,4,6,7,8,9
- 1,3,2,4,5,6,7,8,9
- 1,3,2,5,4,6,7,8,9
- 1,3,5,2,4,6,7,8,9

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**3 Exercise 3:** Below is a grammar for expressions involving operator + and integer or floatingpoint operands. Floating-point numbers are distinguished by having a decimal point. Give an SDD to determine the type of each term T and expression E. [20 points]

$$E \rightarrow E + T | T$$
$$T \rightarrow \text{num} \cdot \text{num} | \text{num}$$

$E \rightarrow E_1 + T$	$E.type = (E_1.type == \text{float}    T.type == \text{float})? \text{float} : \text{int}$
$E \rightarrow T$	$E.type = T.type$
$T \rightarrow \text{num}.\text{num}$	$T.type = \text{float}$
$T \rightarrow \text{num}$	$T.type = \text{int}$