Faculteit der Exacte Wetenschappen	Tentamen Compilerbouw
Vrije Universiteit	27-04-2001

Questions can be answered in Dutch or English.

1. Explain the following terms:

a. table compression

b. top-down parser

c. peephole optimizer

d. relocation bits

2. Lexical analysis:

a. What is the dot motion rule for a lexical item of the form

$$[\, T \rightarrow \alpha \cdot (\, R \,)? \; \beta \,] \quad ?$$

b. Explain this rule.

3. Parsing: Construct the $LR\,(0)$ automaton for the grammar

$$S \rightarrow x\, x\, S \mid a$$

where x and a are terminal symbols.

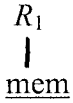
4. Context handling:

a. Describe briefly the difference between simple and full symbolic interpretation.

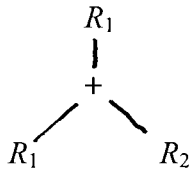
b. Give the dataflow equations for forward and backward dataflow analysis.

5. Code generation: Given a machine with 3 machine instructions:

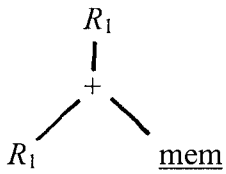
(1) $R_1 := \underline{\text{mem}}$



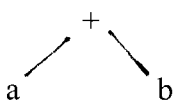
(2) $R_1 := R_1 + R_2$



(3) $R_1 := R_1 + \underline{\text{mem}}$



where mem denotes a memory location, and given the input tree



where a and b are memory locations. The instructions and the tree are presented to a bottom-up tree-rewriting code generator (BURS code generator).

a. Show the sets the BURS code generator builds at the nodes of the imput tree, and explain why is does so.

b. Show the tree or trees that result from the rewriting process.

6. Memory management: Sketch a method by which the positions of pointers in the program data area can be communicated to the garbage collector.

7. Imperative programs: In generating the code for routine calling sequences, the compiler writer has the choice between two frequently used schemes for register saving and restoring: "caller saves" and "callee saves". Explain these schemes briefly and compare their properties.

8. In the Prolog rule

grandparent (X, Z) :– parent (X, Y), parent (Y, Z).

the goal *parent (X, Y)* may match more than one *Y*. How are these multiple values transferred to the second goal *parent (Y, Z)* ?

Assessment:

	1:	2:	3:	4:	5:	6:	7:	8:	
a:	4	5	10	7	7	8	10	8	
b:	4	7		7	5				
c:	4								
d:	4								
	16	12	10	14	12	8	10	8	Total : 90