Faculteit der Exacte Wetenschappen	Tentamen Compilerbouw
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Questions can be answered in Dutch or English.

1. General knowledge: Explain the following terms:

- **a.** table compression
- **b.** top-down parser
- **c.** register allocation
- **d.** symbol table

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. LR parsing: Construct the $LR(0)$ automaton for the grammar

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

where x and a are terminal symbols.

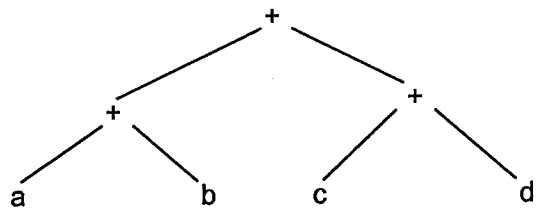
4. Context handling: Explain briefly how 'symbolic interpretation' works

5. Code generation: Given a machine with only two instructions:

$R_n := R_n + R_m$

$R_n := \text{variable}$

How many registers are needed for the translation of the tree (without restructuring the tree)



in which a, b, c, d are variables? Show the calculations for obtaining the result.

6. Code post-processing: Routines can be inlined or cloned (=specialized). Explain the difference.

7. Garbage collection: Describe the marking phase of a mark and scan garbage collector. If your description involves recursion or a stack, where does the stack go?

8. Routines: Routines: Given the nested routines (in C-like notation)

```
void level_0(void) {
    void level_1(void) {
        void level_2(void) {
            ...
            goto L_1;
            ...
        }
        ...
L_1:...
        ...
    }
    ...
}
```

and given that the calling sequence "`level_0` calls `level_1`, which calls `level_2`, which calls `level_2`" has occurred and that the last `level_2` has executed a jump to `L_1`.

a. Draw and explain the chain of activation records before and after the jump.

b. Is the static link (lexical pointer) involved in the jump?

9. Logic programs: In the Prolog rule

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

the goal *parent (X, Y)* may match for 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:	9:
a:	4	5	10	7	8	7	9	12	8
b:	4	7						3	
c:	3								
d:	3								

14 + 12 + 10 + 7 + 8 + 7 + 9 + 15 + 8 = 90