Faculteit der Exacte Wetenschappen	Tentamen Compilerbouw
Vrije Universiteit	26-04-2002

Questions can be answered in Dutch or English.

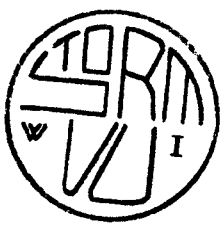
1. Explain the following terms:

a. symbol table

b. parse table

c. static attribute evaluation

d. BURS



2. A lexical analyser is constructed to recognise two patterns *a* and *a*b*. It is given the input *aaa$* in which *$* signals the end of the input.

The lexical analyser will have to read to the end of the input to see that the input does not match the pattern *a*b*. How can it still yield the first *a* of the input as the first recognised token?

3. An example of an $LR(0)$ item is:

$$[A \rightarrow Bc \cdot De]$$

a. Describe the meaning of the components.

b. What additional information is kept in an $LR(1)$ item ?

4. Given the transition table

	0	1	2	3	4	5
A	A					B
B	A					B
C	C				D	
D		E		F		
E			A			
F			B			

a. Show how this matrix is compressed by the row displacement method.

b. How is element [C, 4] accessed ?

c. How is the empty element at [B, 4] accessed ?

5. Consider the attribute grammar rule

$$N(i_1, i_2, s_1, s_2) \rightarrow P(i_1, s_1, s_2)\ Q(i_1, s_1)$$

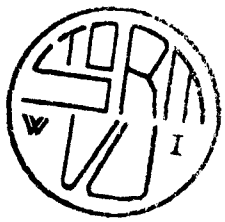
{ $N \cdot s_1 := P \cdot s_1$;

$N \cdot s_2 := P \cdot s_2$;

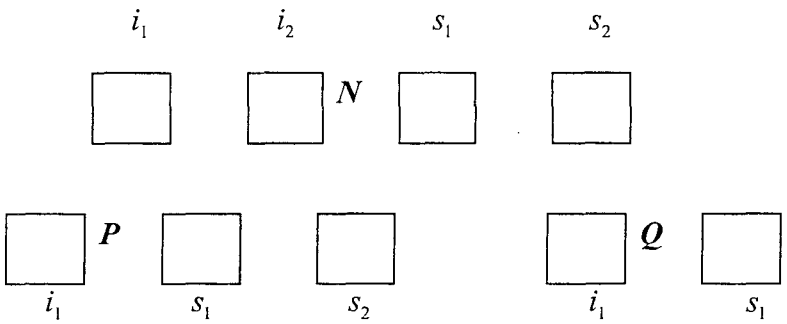
$P \cdot i_1 := N \cdot i_1 + Q \cdot s_1$;

$Q \cdot i_1 := N \cdot i_2$;

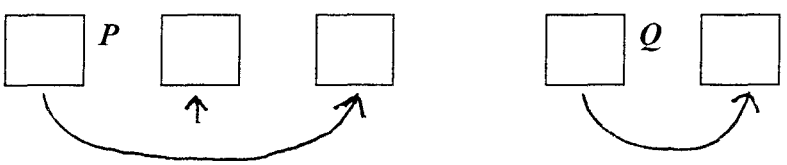
}



a. Draw the dependency graph for N, in the following shape:



b. Given the IS-graphs for P and Q,



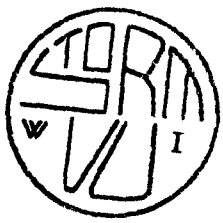
and given that the IS-graph of N is still empty, show how the new update of the IS-graph of N is constructed.

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

7. 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` calls `level_2` 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?

8. Logic programs: 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:	3	8	6	8	4	9	12	8	
b:	3		5	3	7		3		
c:	4			3					
d:	4								
	14	8	11	14	11	9	15	8	Total : 90