



Questions can be answered in Dutch or English.

1. General knowledge: Explain the following terms:

- a. parser
- b. table compression
- c. dataflow equations
- d. interpreter

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

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

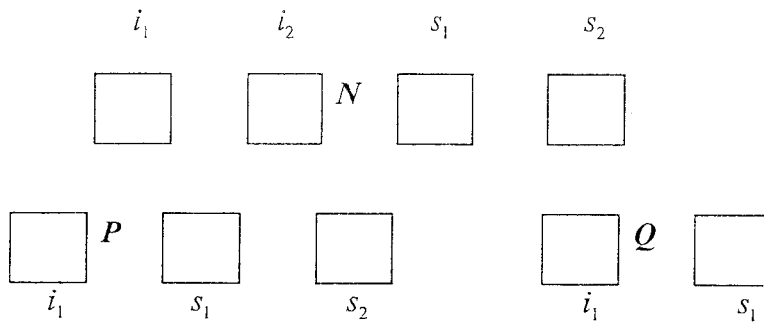
where x and a are terminal symbols.

4. Consider the attribute grammar rule

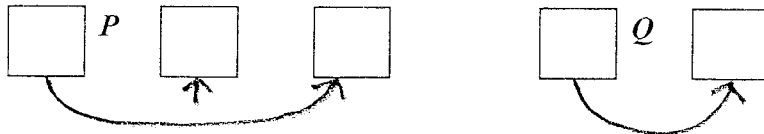
$$N(i_1, i_2, s_1, s_2) \rightarrow P(i_1, s_1, s_2) Q(i_1, s_1)$$

$$\begin{cases} N \cdot s_1 := P \cdot s_1 ; \\ N \cdot s_2 := P \cdot s_2 ; \\ P \cdot i_1 := N \cdot i_1 + Q \cdot s_1 ; \\ Q \cdot i_1 := N \cdot i_2 ; \end{cases}$$

- 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.

5. Code generation: Explain briefly how register allocation by graph coloring works.
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. Routines: What is a static link (lexical pointer) and what is it used for?

8. Graph reduction:

a. Sketch the graph corresponding to the expression

twice square 3

b. Sketch the graph corresponding to the definition

twice f x = f (f x)

c. Show the actions of the graph reducer when reducing the graph under **a.** using those obtained from the definition under **b.**, and show the resulting graph.

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:	3	8	10	4	8	8	6	4	8										
b:	4			7				6											
c:	4							7											
d:	3																		
<hr/>																			
	14	+	8	+	10	+	11	+	8	+	8	+	6	+	17	+	8	=	90