Kunstmatige Intelligentie	Deeltentamen II
Vrije Universiteit	**Knowledge-based Systems**
Joris Hulstijn	6th of June, 2001, 13.45 – 15.30

This exam contains 5 questions, distributed over two pages.
Assessment:

Question	1.	2.	3.	4	5	Additional
	10+10	10+10	10+10	10	10+3+7	+10

Exercise 1: Classification

Given the following *covering relation* C.

C	**S_1**	**S_2**	**S_3**	**S_4**
D_1	0	?	?	?
D_2	?	1	0	?
D_3	?	?	1	1
D_4	1	?	?	?
D_5	?	1	?	0

a. Suppose we offer the following data vector: D = (? 1 0 1 1). Indicate for each solution class whether it will be *inconsistent*, *consistent* or whether it will *match.* (Hint: first draw a graphical representation of *C*).

b. This exercise is about the MC4 method of *classification (data driven hierarchical classification*). This method is applied among other in the knowledge based systems development environment MOLE.
   1. Describe briefly the steps in the MC4 algorithm. (8 lines)
   2. Under which circumstances is MC4 used to its best effects? (6 lines)

Exercise 2. Configuration

The rules of the widget example are given (see Appendix). Moreover, parts have the following costs:

Part	**A-1**	**A-2**	**B-1**	**B-2**	**C-1**	**C-2**	**D-1**	**D-2**
Costs (Dfl)	50	20	20	40	5	10	40	20

a. Determine a minimal space configuration, for the specification {A, B}. Parts caqn not be shared. In case there are more configurations having the same spatial requirements, select the cheapest.

b. The configuration system VT uses *fix knowledge*. What role does fix knowledge play in the "*propose and revise"* mechanism which is applied by VT?

Exercise 3. CommonKADS

CommonKADS distinguishes three main knowledge levels*: task, inference* and *domain*.

a. Briefly indicate two major differences between CommonKADS and object-oriented design methods, with respect to the relation between these knowledge levels.

b. Describe two advantages of the use of standard task models in CommonKADS.

Exercise 4. Legal Knowledge-based Systems

Despite the fact that lawyers are often said to be formal, in practice it turns out to be very hard to implement legal reasoning using logical techniques.

Name 4 reasons for the difficulties in implementing legal reasoning. Give an example of each of the four aspects.

Exercise 5. Diagnosis

a. The GDE (general diagnostic engine) proceeds in three steps. Explain in which step, and in which way Shannon Entropy is used (8 lines)

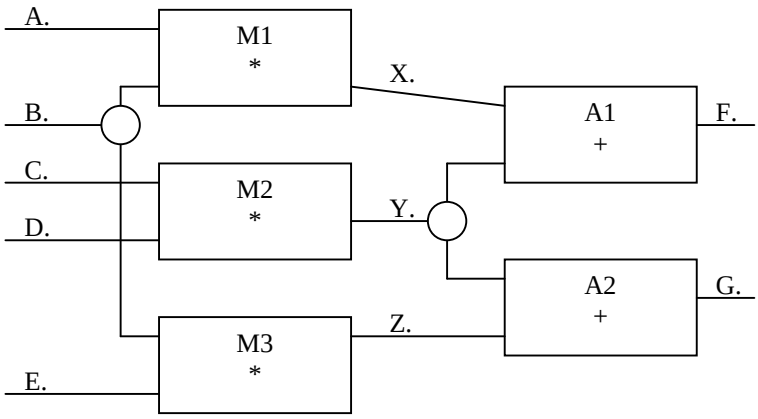

Figure 1: electric circuit

View the electric circuit in figure 1. It contains three multipliers (M1, M2, M3) and two adders (A1 and A2). each part is modelled by a simple *behavioural model*. The behaviour of M1 for example, is modelled by the equation $X = (A*C)$. Given the following input. A= 3, B=2, C=2, D=3, E=3.

b. Make a prediction for the output at F and G using forward simulation.

c. Suppose that F=10, and that G is as expected. We try to reduce the found conflict to a faulty part, using backward simulation. Indicate for each test point (X, Y and Z) the expected values, and the list of assumptions about which parts may still be defect. .