Faculteit Wiskunde en Informatica Vrije Universiteit, Amsterdam Joris Hulstijn	**Exam part II Knowledge-based Systems** Wednesday, 5th of June, 13.45-15.30

name:
student number:

Assessment:

Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5	extra
10 +8	10	18	16 + 8	8 +12	10

Exercise 1: Introduction

a. There are several types of knowledge intensive tasks. What is the difference between *analytic tasks* and *synthetic* or *constructive tasks*? Give an example of both.

b. Which are the economic advantages of the application of a configuration system for a company that produces consumer electronics (TV sets, CD players, etc)?

Exercise 2: Legal Knowledge-based Systems

Explain the difference between *rule-based reasoning* and *case-based* reasoning.

Exercise 3: Classification

Consider the following classification scheme. First, raw data (R_i) is combined by means of the logic operators $\wedge$ (and) $\vee$ (or) en $\neg$ (not). This produces abstract data (D_i), which is subsequently used for hierarchical classification into distinct solution classes (S_i).

Indicate for each of the following data vectors, which solution classes are *consistent*, which *match* and which are *inconsistent* with the data.

a. R = (1 ? 0 1 0 ? ?)

b. R = (0 1 0 0 0 1 0)

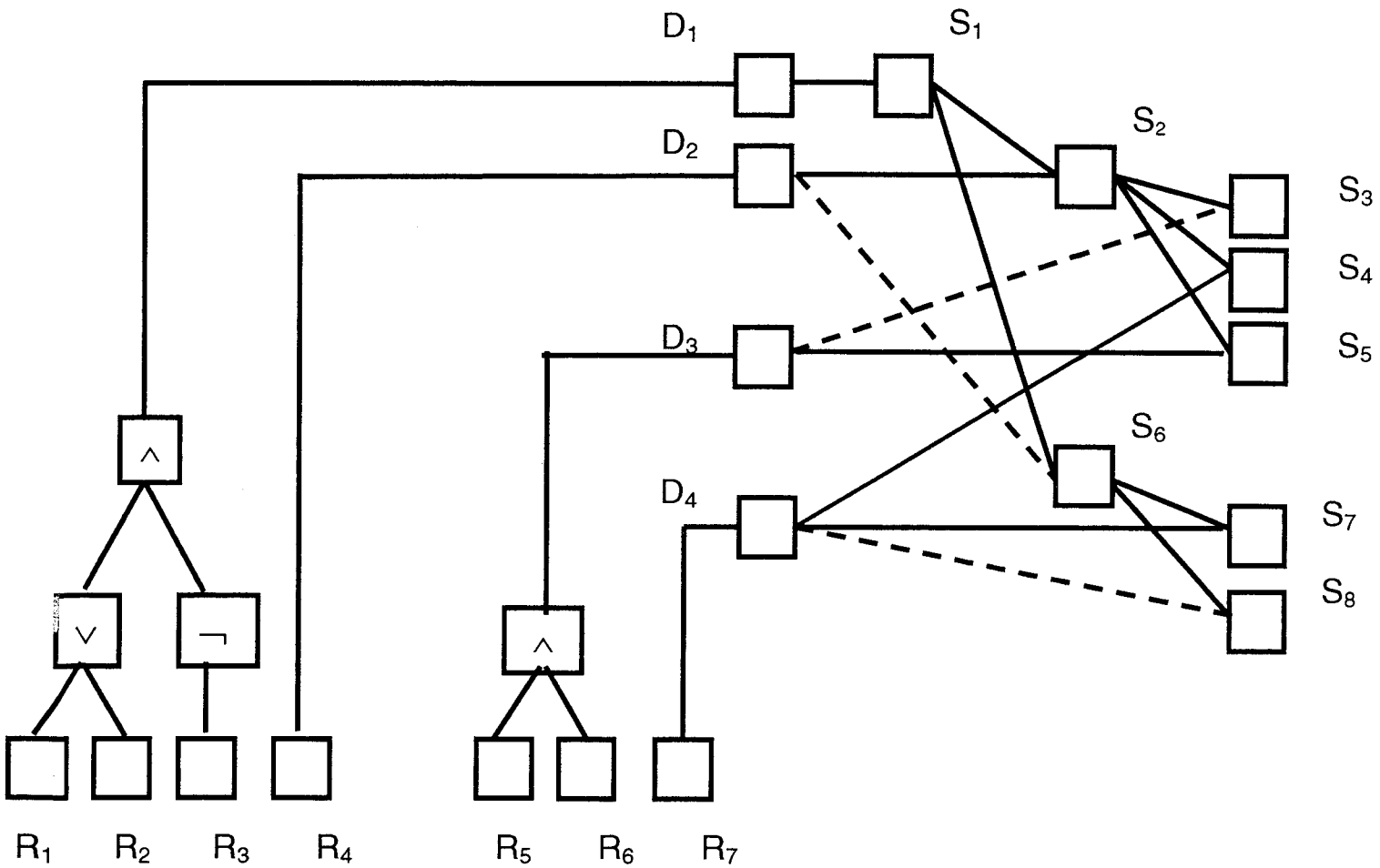

figure 1: classification scheme

Exercise 4: Garden Design (configuration)

Designing a garden is a tough task. A garden has a structure of paths and flowerbeds between. In the flowerbeds plants and shrubs must be placed, to generate plenty of colour throughout the year. A catalogue is available that helps to select plants, given the type of garden, the type of soil, the desired colour and shade conditions

a. Show that designing a garden can be seen as a configuration task. Use a drawing to indicate how the specification and the configuration spaces are filled in, with all the necessary knowledge models.

In practice, garden design proceeds in a number of steps. In between steps, no back-tracking is needed. It is possible to look one step ahead.

step 1. Determine the boundaries of the garden (house, fence), the most important areas (terrace, shed) and the walking routes in between.
step 2. Design the paths, using the walking routes. The spaces in between the paths become flowerbeds. Place all large objects (trees, pond).
step 3. Select material for the paths and terrace (tiles, grass). Determine the type of each flowerbed (Japanese, rock garden)
step 4. Select for each flowerbed those plants from the catalogue, which suit the type of garden, the soil and the shade conditions.

b. Is this configuration method an instance of MCF1, MCF2 or MCF3? Why?

Exercise 5: Diagnosis

In determining the most useful observation or test (*probe selection*) for giving a diagnosis, one can make use of the expected information value of the answer. However, there are other aspects involved.

a. Name three other factors that influence the choice of diagnostic test.

Consider the following electronic circuit, consisting of two multipliers (M1 and M2), two adders (A1 and A2) and a couple of connections. Contrary to expectations, the result at T1 is 0. We try to find the causes of this defect, using *backward simulation*. Assume that input values are non-negative (≥ 0).

b. Indicate for each of the testing points (T1 - T4) the possible results, with the corresponding assumptions about which components do or do not function correctly.