

Knowledge-Based Systems Exam

June 13, 2005

18.30 – 21.30

This exam consists of 5 questions on 2 pages and 1 appendix.

Credits:

1a	1b	1c	2a	2b	2c	3a	3b	3c	4a	4b	4c	5a	5b	5c	5d
3	5	8	3	8	5	4	4	8	4	4	4	6	2	3	4
16			16			16			12			15			

Total points = 75

Be sure to answer all sub-questions. Good luck!

Exercise 1: Symbols and meaning

According to the *physical symbol hypothesis* symbol systems are a sufficient condition for intelligent action. Knowledge-based systems internally work with symbols.

- What is the difference between a symbol and a general marking (or *pattern*)?
- Why is it necessary to give meaning to symbols?
- List to ways to give meaning to symbols and describe them briefly.

Exercise 2: Problemsolving as search

Many knowledge-based systems use search techniques to solve problems. To do so, a first requirement is to interpret the problem as a search problem. Consider the following problem. The GVB has to decide for a specific day which metro or light-rail (*sneltram*) cars to use at which route and which drivers to assign to them. There are all kind of restrictions, like the number of trains on a route, the fact that a light-rail car can be used for a metro route but not vice-versa, and the fact that some drivers can only drive one type of train.

- Formulate the problem above as a search problem. Start your sentence with: "Search for...".

In a next step, the search space should be defined. This can be done using a state-space. A state space is defined by: 1) states, 2) state transitions, 3) an initial state, and 4) a final state.

- Define the elements of the state-space for the problem described above.
- What is the name of this task? Motivate your answer.

Exercise 3: Representations of time and uncertainty

Time can be represented in a continuous way and a discrete way.

- Explain the difference between both.

Another dimension of the representation of time is qualitative versus quantitative.

- b) List two statements about time that can be formulated based on a qualitative representation of time.

Both *probability theory* and *certainty factors* are used to represent uncertainty.

- c) List an advantage and a disadvantage for both of the two approaches. Explain why the things that you mention are an advantage or a disadvantage.

Exercise 4: Classification

Classification is assigning objects to classes based on observations.

- a) What is the difference between an solution that is consistent with the observations and a solution that matches or explains the observations. Illustrate your answer with an example.
- b) What is the advantage of using a hierarchal classifier compared to a non-hierarchical one?
- c) What is the difference between using a hierarchal classifier and applying data abstraction?

Exercise 5: Configuration

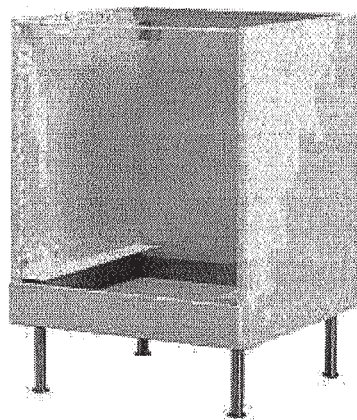
Building a kitchen is a classical example of a configuration task. Configuration requires, among other things, knowledge about part and their relations.

- a) List three types of knowledge about (relations between) parts that are possible relevant for describing a configuration task.

In the appendix you find a copy of a webpage about a kitchen cabinet from IKEA.

- b) Use the IKEA description to give one example of knowledge about relations between parts.
- c) Also give one example of other knowledge in the description that is relevant for configuration. Explain why this knowledge is relevant.
- d) Finally, give one example of knowledge about sharing that can be found in the description and explain what type of sharing it is.

End of exam questions.



Base cabinet for oven

FAKTUM

£33.00

(price reflects selected options)

- ▶ Adapted for built-in oven.
- ▶ Convenient drawer for storing baking sheets, pot lids, cookery books etc.
- ▶ Can be pulled out entirely for easy access and overview.
- ▶ Sturdy frame construction, 18 mm thick.
- ▶ The doors are covered with melamine, which provides a scratch-resistant surface.

designer: IKEA of Sweden

[enlarge image](#)

front

Ärlig white

[check stock availability at your local store](#)

care instructions

Wipe clean with a cloth damped in water or a non-abrasive detergent.
Wipe dry with a clean cloth.

good to know

Different wall materials require different types of fixing devices. Use fixing devices suitable for the walls in your home.
Legs are sold separately.
To be completed with a knob or a handle, sold separately.

environment

Fascia panel:
Renewable raw material (chips).
The material in this product may be recyclable. Please check the recycling rules in your community and if recycling facilities exist in your area.
Cabinet for built-in oven/hob:
Renewable raw material (chips).
Renewable raw material (wood fibres).
The material in this product may be recyclable. Please check the recycling rules in your community and if recycling facilities exist in your area.

product description & measurements

Fascia panel:
Basematerial: Particleboard
Front side/ Backside: Melamine foil
Edge: ABS plastic

Cabinet for built-in oven/hob:
Basematerial/ Back rail: Particleboard, Melamine foil
Front rail: Steel, Pigmented epoxy/polyester powder coating
Supporting rail: Steel, Galvanized
Back: Fibreboard, Acrylic paint

Drawer under oven:
Drawer: Steel, Anti-corrosive phosphate coating, Pigmented epoxy/polyester powder coating
Drawer bottom: Particleboard, Melamine foil
Plastic parts: ABS plastic, Polyamide plastic, Reinforced polyamide plastic, Acetal plastic, Synthetic rubber
Drawer rail: Galvanized steel
Front fixing: Zinc

Width: 60 cm
Depth: 60 cm
Height: 86 cm

this product requires assembly



article number(s), package measurements & weight