Course: **010 595 002 - ARTIFICIAL INTELLIGENCE**

Lecturer: Jan VORACEK Examination date: 25.8.2003

Notes: *a) Students can use an English dictionary and calculators. Any other tools or literature are disabled*
b) Type, please, your answers in English

Example 1

Let us have 3x3 TIC-TAC-TOE game and be in the state when the computer, playing with *X*s, has to make the initial (starting) move on the empty board.

a. Define and justify a single winning heuristics for the computer.
b. Draw the corresponding game tree to the depth level 2, which shows the situation after 1 and 2 move of computer (2 *X*s and 1 *O* in each particular state). Use the **hill climbing** technique to reduce the searched space and annotate all investigated tree leaves with the proper value of total cost function *f*, in the form how it is considered for this technique. Mark explicitly the node(s) applicable for the next expansion.

Example 2

If we know that ***birds can fly***, which of the following possibilities are appropriate?

a. This fact can be categorized as an object (entity) inside a corresponding knowledge base.
b. *CanFly(birds)* is a logical level expression of the fact.
c. The knowledge level expression of this fact can be *birds have wings, so they can fly*.
d. We can use propositional logic, instead of the first-order logic calculus, to express such a fact.

Example 3

Find and justify the most appropriate **inference type** (having available just forward chaining, backward chaining and their combination) for each of the following problems:

a. Selecting a study specialization.
b. Playing a deterministic logical game.
c. Making a programming exercise.
d. Debugging am existing executable software.
e. Investigating a murder.

Example 4

Find and justify the most appropriate type of **problem solver** (having available just conventional logic, fuzzy logic and statistics) for each of the following problems:

a. Medical diagnosis.
b. Legal reasoning (murder investigation).
c. Meteorological forecasting.
d. Planning a route.

Example 5

Machine learning (*ML*) deals particularly with the following three cases: supervised, unsupervised and reinforcement learning.

a. Characterize each of them and explicitly point their mutual differences. Illustrate your answer with concise examples.
b. How are the neural network (NN) paradigms used for supervised and supervised learning?
c. What is the main difference between ML and NN?