Subject: **1595 - Artificial Intelligence**

Lecturer: Jan VORACEK Examination date: 27.1.1999

Notes: *a) calculators, dictionaries and mathematical handbooks are allowed*
b) type, please, your answers in English

Problem 1 - Agents *(8 pts.)*

I. Describe and (preferably) outline the main differences between:
   a) simple reflex agents
   b) agents that keep track of the world
   c) goal-based agents
   d) utility-based agents

II. Classify following real systems into one of above given classes `a)-d),` e.g., `1a` etc. :
   1) complex decisions making systems
   2) planners
   3) belief networks
   4) systems, using situation calculus and diagnostic or causal rules
   5) theorem provers
   6) searching systems
   7) production systems

III. Emphasize the difference between (inductive) learning and non-learning approach to the intelligent agent creation.

Problem 2 - Search parameters *(2 pts.)*

Often we say that the space complexity of breadth-first search is $O(b^d)$ and the space complexity of depth-first search is $O(bl)$. What do **b,d** and **l** stand for?

Problem 3 - Simulated annealing *(2 pts.)*

What happens as the "temperature" drops?

Problem 4 - General agent building approaches *(5 pts.)*

a) Compare deductive, abductive and inductive methods of inference.
b) For each of above mentioned methods specify the most suitable application area and document your conclusions with an example.

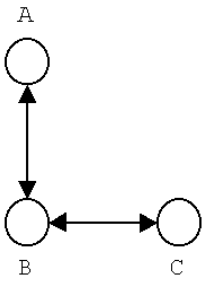
Problem 5 - Probability based reasoning *(2 pts.)*

Let us suppose, that $P(A=a|B=b)=0$. What can you say about $P(B=b|A=a)$?

Problem 6 - Bayes rule *(5 pts.)*

A lie detector test is known to be 80% reliable when the person is guilty and 95% reliable when the person is innocent. If a suspect is chosen from a group of suspects of whom only 1% have ever committed a crime, and the test indicates that he is guilty, what is the probability that he is innocent ?

Problem 7 - Prolog recursion *(6 pts.)*



A railway company serves cities `A,B,C` (see Fig).
a) Write a recursive fragment of Prolog program, that can determinate, which cities are connected, either directly or indirectly. Explain the meaning of single rules.
Hint: Query example could, e.g., be:

```
?- connection(a,b), connection(a,c).
Yes.
```

b) What happens, if the question

```
connection(a,d)
```

is asked and how to suppress this behavior? Feel free to describe briefly or sketch your ideas.