

January 30, 2003

CSC/CPE 481

Midterm Exam

Winter 2001

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Task I – Multiple Choice Questions

Mark the correct answers (only one per question).

- a) Which of the following statements is the best characterization of *backward reasoning*?
- Available evidence is combined step by step until an acceptable solution is found
 - A possible solution is formulated as a hypothesis, and evidence for the hypothesis is systematically assembled.
 - All types of reasoning where backtracking is not allowed.
 - It is essentially the equivalent of breadth-first search. 3
- b) In which situations is *forward reasoning* typically appropriate?
- There are relatively few facts, and many acceptable conclusions.
 - There are many facts, and only a few acceptable conclusions.
 - There are no facts for some acceptable conclusions.
 - There are many facts, but no hypothesis can be formulated in advance. 3
- c) What is the purpose of the *working memory* in CLIPS?
- contains all currently available facts
 - restricts the facts that can be utilized at a certain point
 - contains all activated rules
 - contains a trace of fired rules 3
- d) What is the basic idea of *certainty factors* with respect to uncertainty in knowledge-based systems?
- under certain conditions, it allows the calculation of the probability of a cause given some symptoms for the cause
 - it is a mathematical theory of evidence based on intervals indicating the range of belief in a statement
 - it uses linguistic variables to describe concepts with vague values
 - it expresses a measure of belief in a hypothesis, as supported by available evidence 3
- e) What is the contribution of *Post Production Systems* to expert systems as we know them now?
- they characterize a subset of rules that can be executed very efficiently
 - the discovery that in principle any formal system in mathematics or logic can be formulated as a set of production rules
 - they are the basis for the PROLOG programming language which is frequently used for the development of expert systems
 - they are the only practical way to capture the semantics of rule-based expert systems 3

- f) What is *epistemology*?
- the science of knowledge
 - the scientific investigation of epidemics
 - a medical discipline that served as application domain for some of the very first expert systems
 - the scientific investigation of epistles
- g) Which statement is the best characterization of *frames* in the context of knowledge-based systems?
- a frequently used method to formulate the knowledge in expert systems based on rules that describe the conversion of symbol strings into other symbol strings
 - a knowledge representation method based on graphs
 - a knowledge representation method that represents related knowledge about a subject through groups of slots and fillers
 - a knowledge representation method particularly suited for time-ordered sequences, e.g. of events
- h) Which statement is the best characterization of *scripts* in the context of knowledge-based systems?
- a frequently used method to formulate the knowledge in expert systems based on rules that describe the conversion of symbol strings into other symbol strings
 - a knowledge representation method based on graphs
 - a knowledge representation method that represents related knowledge about a subject through groups of slots and fillers
 - a knowledge representation method particularly suited for time-ordered sequences, e.g. of events
- i) What does *deep reasoning* mean?
- A solution is only found “deep down” in the search tree.
 - It is a particularly efficient reasoning method based on depth-first search.
 - A causal chain of cause and effect can be established across the application of different rules.
 - The knowledge is encoded as heuristics in very few rules
- j) In which of the following approaches to uncertainty does the term *disbelief* play a central role?
- certainty factors
 - fuzzy logic
 - Bayesian reasoning
 - Dempster-Shafer theory

Task II – Short Questions

1. Describe the main differences between *frames* and *semantic networks* with respect to the representation and processing of knowledge. What are the respective advantages and problems?

<i>Aspect</i>	<i>Frames</i>	<i>Semantic Networks</i>
<i>Features</i>		
<i>Differences</i>		
<i>Advantages</i>		
<i>Problems</i>		

2. What are the main sources of uncertainty in knowledge-based systems? List at least five, and briefly discuss their relevance to your team project!

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(a)

(b)

(c)

(d)

(e)

3. Discuss the suitability of the *waterfall model* from Software Engineering for the development of knowledge-based systems. In particular, point out problems that occur because of the methods that are frequently used in knowledge-based systems.

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<i>Aspect</i>	<i>Waterfall Model</i>
<i>key differences</i>	
<i>positive</i>	
<i>negative</i>	

Task III – The Linear Model and Your Team Project

In this part, your task is to evaluate the suitability of the so-called *linear model* of expert system development for the system your team is developing as the term project in this class. The task consists of several subtasks: A *presentation of the team project*, with an emphasis on the collection, representation, processing, and utilization of knowledge for the selected task and domain. Then you should give a short *explanation of the model*, where you need to clarify the underlying idea of the linear model, explain its different stages, and identify the important events and documents that are affiliated with the stages. You can either draw a separate diagram of the model, or list the stages in the table below, and refer to this table in your explanation. After this explanation, you need to discuss the *application of the model to the team project*. This includes a mapping of the activities you either already performed or are planning to perform in your project onto the stages of the model. If there are no activities for a particular stage, you need to explain the reasons for this. Also identify events and documents in your project, and how they relate to those in the model. The final subtask is an *evaluation of the suitability of the model*. Here you need to give an overall recommendation if the model is suited for the use in the context of your team project, or not. This recommendation should be justified.

Presentation of the team project

NAME:

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Explanation of the model

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NAME:

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Evaluation of the suitability of the model

5

Total Points: 40
100