

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
MAY SUPPLEMENTARY EXAMINATION 2005

SUBJECT: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS
CODE: SCS5203

INSTRUCTION TO CANDIDATES

This paper consists of **seven** questions
Answer any **five (5)** questions

QUESTION ONE

The following Prolog Program says that two people are relatives if:

- i. One is a predecessor of the other, or
- ii. They have a common predecessor, or
- iii. They have a common successor:

Relatives (x, y):-
 Predecessor (x, y).

Relatives (x, y):-
 Predecessor (y, x).

Relatives (x, y)
 Predecessor (z, x)
 Predecessor (z, y)

Relatives (x, y)
 Successor (x, z)
 Successor (y, z).

- a) Shorten this program by using the semi-colon. [5]
- b) What would be the result of the following Prolog query?
 ?-[Head/Tail]=[Tom, Sue, Joe, Mary]. [5]
- c) Show that the proposition $((A \wedge (A \rightarrow B)) \rightarrow B)$ is a **Tautology**. [8]
- d) With the help of examples, define a **Predicate**. [2]

QUESTION TWO

- a) State what is meant by Conflict Resolution in a Production System, and describe three possible Conflict Resolution Strategies. Explain why more than one conflict resolution strategy is usually needed. [10]
- b) Explain Backtracking [5]
- c) Why did the General-purpose Problem Solver fail? [5]

QUESTION THREE

Consider the following variables:

- A=Have \$10 000 000
- B=Younger than thirty
- C= Education at college level
- D=Annual income of at least \$40 000 000
- E=Invest in securities
- F=Invest in growth stocks
- G=Invest in kingdom stock.

Each of these variables can be answered as true (yes) or false (no).

The facts: Let us assume that an investor has \$10 000 000 and she is twenty- eight years old. She would like advice on investing in Kingdom Stock.

The rules: Let us assume that our knowledge base includes the following five rules:

R1: If a person has \$10 000 000 and she has a college degree, THEN she should invest in securities.

R2: If a person's annual income is at least \$40 000 000 and she has a college degree, THEN she should invest in growth stocks.

R3: If a person is younger than thirty and if she is investing in securities, THEN she should invest in growth stocks.

R4: If a person is younger than thirty, THEN she has a college degree.

R5: If a person wants to invest in growth stock, THEN the stock should be Kingdom.

- a). Inferencing with Backward Chaining, advise the Investor whether to invest in Kingdom stock or not. [15]
- b). The best-first method is described as 'greedy'. Explain why. [5]

QUESTION FOUR

- a) Knowledge acquisition has been described as the 'bottle neck' towards building an expert system. Discuss this assertion in detail. [14]
- b) Relate three factors that distinguish an expert system from a more conventional applications program. [6]

QUESTION FIVE

Consider the following statements about an elephant:

- A mammal is a kind of animal
- Walking is the normal moving method of mammals
- An elephant is a mammal
- Horatio is an elephant
- An elephant has a task, and so does horatio

- a) Represent these as a semantic network, with *isa* and *ako* relationships [10]
- b). Outline the advantages of Fuzzy Logic in Artificial Intelligence. [10]

QUESTION SIX

- a) What are expert systems? Draw a figure, and describe the components of an Expert System (ES) and their relationships. [10]
- b) Discuss the factors that have slowed down the commercial spread of ES. [10]

QUESTION SEVEN

- a) Briefly explain six steps involved in problem solving [12]
- b) Contrast Natural Intelligence and Artificial Intelligence [8]

THE END