
NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
DECEMBER EXAMINATION 2004

SUBJECT: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS
CODE: SCS5203

INSTRUCTION TO CANDIDATES

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

QUESTION ONE

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

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). Distinguish between **deductive** and **inductive** reasoning [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 Forward Chaining, advise the Investor whether to invest in Kingdom stock or not. [15]

b). Define the following terms

- i. Knowledge Engineering [2]
- ii. Deep Knowledge [2]
- iii. Inference Engine [1]

QUESTION FOUR

a). A major difference between a conventional decision support system and ES is that the former can explain a '**how**' question whereas the latter can also explain a '**why**' question. Discuss. [14]

b) The best-first method is described as '**greedy**'. Explain why. [5]

c). What do you understand by the term '**meta -knowledge**'? [1]

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 tusk, 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) Describe the components of Blackboard Architecture. [6]
- b) Compare and Contrast Hill-Climbing and Depth-first search. [8]
- c) What are the differences between Domain-Specific tools and General-purpose tools in Expert Systems? [6]

QUESTION SEVEN

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]

END OF QUESTION PAPER

GOOD LUCK!