UNIVERSITY OF LONDON 291 0310E

BSc EXAMINATION

for External Students : 2006

COMPUTING AND INFORMATION SYSTEMS

CIS310 Artificial Intelligence [Eastern]

Duration: 2 hours 15 minutes

Date and Time: Friday 5 May 2006: 10.00 - 12.15pm

There are *FIVE* questions on this paper.

Do not attempt more than *FOUR* questions. All questions carry equal marks and full marks can be obtained for complete answers to *FOUR* questions.

Questions involving a description or explanation should, wherever possible, be accompanied by an appropriate example.

THIS EXAMINATION PAPER MUST NOT BE REMOVED

FROM THE EXAMINATION ROOM

Question 1

a) Give pseudocode algorithms for both breadth first and greedy search.

[8]

b) Compare and contrast these two algorithms.

[3]

c) For each of the searches described in your answer to a) above:

i) describe conditions that might cause the search to fail

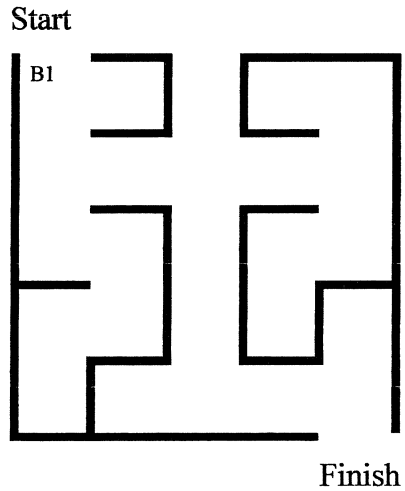
ii) comment on whether the search is complete and optimal, defining both these terms in your answer.

iii) comment on the space and time complexity of the algorithm

iv) give an application in which that search technique might be useful

[9]

d) Copy the following maze (set on a 5x5 grid of squares) into your answer book and describe how this could be searched by a robot if it knows that the start is in cell (Row 1, Column 1) and the finish is in (Row 5, Column 5). Give a description of a good heuristic that the robot might use.



[5]

Question 2

a) What is meant by the phrase 'default logic' in AI? Give an example of its use and explain why it is a useful tool.

[5]

b) Use truth tables to show whether the following pairs of terms are equivalent:

i) $a \wedge (\neg a \vee b)$ and $a \wedge b$

ii) $(a \vee b) \wedge (a \vee c)$ and $a \vee (b \wedge c)$

[2 + 4 = 6]

c) Explain the terms *validity*, *satisfiability*, *entailment* and *a Truth Assignment Function (I)* in model theory.

[12]

d) Why is Propositional Calculus inadequate for reasoning with complex sentences and how is this inadequacy addressed by Predicate Calculus?

[2]

Question 3

Write notes on the following, giving examples where appropriate:

a) Simulated annealing

b) Frames

c) Intelligent Agents

d) Non-monotonic reasoning in knowledge representation

e) Planning, including ordered plan, linear and non linear plans.

[5x5]

Question 4

a) What are the 5 levels of analysis needed for natural language processing? (Your answer should give them in the order that they are likely to occur)

Explain the first three of these levels giving examples where possible.

[11]

b) A grammar has the following rules:

s→ np vp	det → [an]
np →det n	det → [every]
np → np pp	n → [monkey]
vp → v np	n → [elephant]
vp → vp pp	n → [apple]
pp → prep np	prep → [with]
det → [a]	v → [fed]

i) Draw syntactic trees for the following sentences:

1) 'Every monkey fed an elephant'

2) 'A monkey fed every elephant with an apple'

[6]

ii) What changes need to be made to the grammar to allow the sentence 'each monkey fed' to be analysed?

[3]

c) What problem is caused by sentences such as 'Every monkey fed an elephant' to a system that is trying to represent the meanings of sentences?

[2]

d) Why might an intelligent system need to represent meanings of sentences in formal logic?

[3]

Question 5

a) Distinguish between strong and weak AI

[2]

b) Searle has given a scenario to enable us to think about what it means for a machine to be intelligent. Briefly outline this scenario and the major conclusions that Searle draws from it.

[5]

c) For each of the following 'Replies' outline both the argument and the replies given by Searle:

i) The systems reply

ii) The robot reply

iii) The brain simulator reply

iv) The combination reply

v) The other minds reply

vi) The many mansions reply

[6 x 2]

d) State explicitly any conclusions that you think reasonable from your answers to i) to vi) above.

[6 x 1]

END OF EXAMINATION