UNIVERSITY OF LONDON

291 0310W

BSc EXAMINATION

for External Students : 2006

COMPUTING AND INFORMATION SYSTEMS

CIS310 Artificial Intelligence [Western]

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 pseudo code algorithms for both depth first and for best first search.

[8]

b) Compare and contrast these two algorithms.

[6]

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

i) describe conditions that might cause the search to fail

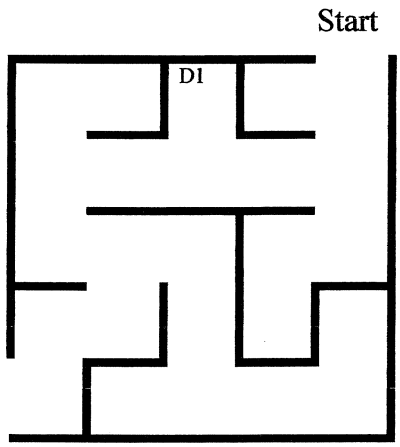
ii) comment on whether the search is complete and optimal, defining both of these terms in your answer.

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

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

[6]

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 5) and the finish is in (Row 5, Column 1). Give a description of a good heuristic that it might use.



[5]

Question 2

a) What is meant by 'the frame problem' in AI? Give an example of it and explain why it might cause problems to an intelligent agent.

[5]

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

i) $\neg c \vee (c \wedge d)$ and $\neg c \vee d$

ii) $(c \wedge d) \vee (d \wedge e)$ and $c \wedge (d \vee e)$

[6]

c) Explain the terms *theorem*, *soundness*, *completeness* and *a Truth Assignment Function (I)* in model theory.

[12]

d) What does it mean when we say that 'Propositional Calculus is sound and complete'?

[2]

Question 3

Write notes on the following:

a) Tabu search

b) Scripts

c) The types of environments that agents might have to cope with. (Include an explanation of the terms: *accessibility*, *deterministic*, *episodic*, *static*, *dynamic*, *discrete* and *continuous* in your answer)

d) The closed world assumption in knowledge representation

e) Strips notation in planning

[5x5]

Question 4

a) What are the 5 levels of analysis needed for natural language processing? (Your answer should give them in the order in which 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 → [a]
np →det n	det → [every]
np → np pp	n → [bear]
vp → v np	n → [salmon]
vp → vp pp	n → [paw]
pp → prep np	prep → [with]
	v → [caught]

i) Draw syntactic trees for the following sentences:

1) 'Every bear caught a salmon'

2) 'A bear caught every salmon with a paw'

[6]

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

[3]

c) What problem is caused by sentences such as 'Every bear caught a salmon' 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) Turing 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 the Turing draws from it.

[7]

c) For each of the following arguments outline both the argument and the replies given by Turing:

i) The mathematical objection

ii) The argument from consciousness

iii) Lady Lovelace's objection

iv) The argument from informality of behaviour

[4 x 2]

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

[4 x 2]

END OF EXAMINATION