UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE

ARTIFICIAL INTELLIGENCE 3

Date: 30 May 1988 Time: 09.30 - 11.00

Examiners: Chairman - J.A.M. Howe
External - A.G. Cohn

KNOWLEDGE REPRESENTATION AND INFERENCE 1

INSTRUCTIONS TO CANDIDATES

1. Answer **TWO** questions

2. Each question is marked out of 100%. The marks at the side of the questions show how these are apportioned.

3. If more than two questions are attempted, candidates should cross out the answer which is **NOT** to be marked. Otherwise, the examiners will mark only the first two answers which appear in the script.

Question 1

(a) One of the criteria that can be used to evaluate a scheme for knowledge representation is its ability to handle *default reasoning*. For example, given the fact "Percy is a bird" we should be able to infer that Percy can fly, but when presented with the additional information "Percy is a penguin" we should be able to infer that Percy can't fly after all.

Represent this example, or an example of your choice, in each of the following knowledge representation formalisms, showing how defaults can or cannot be established and overridden:

* first-order logic
* semantic networks
* production systems.

[75%]

(b) Briefly compare the advantages and disadvantages of first-order logic and semantic networks.

[25%]

Question 2

Discuss the pros and cons of production systems for knowledge representation in expert systems.

[100%]

Question 3

(a) Use resolution to prove that from the premises:

$$\forall x.(boy(x) \Rightarrow \exists y.(girl(y) \wedge loves(x,y)))$$
$$\forall y.(girl(y) \Rightarrow lovable(y))$$
$$boy(mortimer)$$

it follows that

$$\exists y.(girl(y) \wedge lovable(y))$$

Present and explain each step in the procedure you use

[75%]

(b) What advantage does resolution have over the usual inference rules of first-order logic when searching for the proof of a theorem? Can you think of any disadvantages?

[25%]