PAPER CODE NO. **COMP310/COMP510**	EXAMINER : Michael Wooldridge DEPARTMENT : Computer Science Tel. No. 4-3670

THE UNIVERSITY of LIVERPOOL

MAY 2002 EXAMINATIONS

Bachelor of Science : Year 3
Master of Science : Year 1

Multiagent Systems

TIME ALLOWED : $2\frac{1}{2}$ hours

INSTRUCTIONS TO CANDIDATES

This paper contains **five** questions in total. Answer **any four** questions only.

If you attempt to answer more questions than the required number of questions (in any section), the marks awarded for the excess questions will be discarded (starting with your lowest mark).

Question 1

a) The concept of an agent is usually defined by listing the properties that agents exhibit. Identify and explain the properties that you would associate with the concept of an intelligent agent.

[10 marks]

b) Agents are related to but distinct from "objects" in the sense of object-oriented programming. With particular emphasis on the role that communication plays in object and agent systems, explain the distinctions between the two concepts.

[5 marks]

c) Tasks for agents may be specified in a number of different ways. Define and critically assess the main approaches to task specification with which you are familiar.

[10 marks]

Question 2

a) Explain (with references to the work of Austin, Searle, and Cohen et al as appropriate) what you understand by the term "speech act".

[5 marks]

b) Describe the structure of messages in either the KQML or FIPA agent communication languages.

[5 marks]

c) With the aid of examples, explain the role of the Knowledge Interchange Format (KIF) in agent communication languages.

[5 marks]

d) Describe the role of the INFORM and REQUEST performatives in the FIPA agent communication language, and informally define their semantics. (In your answer, ensure that you discuss how these performatives are used to define macro performatives.)

[10 marks]

Question 3

a) Explain, with the aid of examples where appropriate, what you understand by *task sharing* and *result sharing* in the context of cooperative distributed problem solving systems.

[5 marks]

b) The CONTRACT NET protocol is perhaps the most widely used cooperation protocol in the multi-agent systems world. Briefly describe how the protocol works, and the main stages of it.

[10 marks]

c) What are the main issues that must be addressed when implementing the CONTRACT NET?

[10 marks]

Question 4

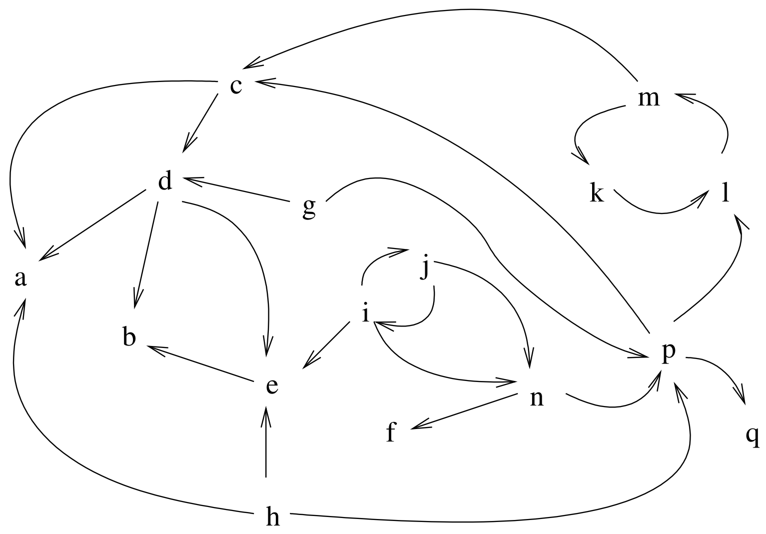
a) Explain what you understand to be an *abstract argument system*.

[5 marks]

b) Explain the notion of "attack" in abstract argument systems.

[4 marks]

c) The following figure shows an abstract argument system.



Explain the status of the following arguments, justifying your answer in each case:

$h \quad e \quad p \quad q \quad i \quad j \quad n \quad f$

[2 marks each]

Question 5

a) Define the *prisoner's dilemma* and the *iterated* prisoner's dilemma.

[5 marks]

b) Under what circumstances is cooperation the rational choice in the iterated prisoner's dilemma?

[5 marks]

c) List and informally define five desirable properties of a negotiation protocol.

[5 marks]

d) Define the *monotonic concession protocol* for negotiation and the *Zeuthen strategy*, and explain to what extent these satisfy the desirable properties of negotiation scenarios that you defined in part (c) of this question.

[10 marks]