INSTRUCTION:

1. This book script contains TEN (10) questions in THREE(3) printed pages excluding the cover page.
2. Answer ALL the questions in the answer book.

CONFIDENTIAL
1. a) Explain the meaning of each of the following terms; 
   (i) Agent  
   (ii) Intelligence  
   (iii) Agent architecture  
   b) State and explain any FOUR (4) application areas for intelligent agents (6 marks)  
   c) Differentiate between agents and expert system (3 marks)

2. Agents exist in an environment; explain the following environments for constructing an intelligent agent.  
   a) Accessible and inaccessible environments (2 marks)  
   b) Deterministic and non-deterministic environments (2 marks)  
   c) Episodic and non-episodic environment (2 marks)  
   d) Static and dynamic environments (2 marks)  
   e) Discrete and continuous environments (2 marks)

3. a) Discuss any FOUR (4) characteristics of intelligent agent (8 marks)  
   b) Discuss how social ability is relevant to agents (5 marks)

4. a) Define what practical reasoning is, and then describe the intentions in practical reasoning agent. (4 marks)  
   b) Suppose you want to build a deliberative agent. Describe the TWO (2) problems that you must address and give your opinion on the general progress on the solution to these problems. (4 marks)

5. Use the following two payoff matrices to answer the questions.
**Scenario I**

<table>
<thead>
<tr>
<th></th>
<th>i defects</th>
<th>i cooperates</th>
</tr>
</thead>
<tbody>
<tr>
<td>j defects</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>j cooperates</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

**Scenario II**

<table>
<thead>
<tr>
<th></th>
<th>i defects</th>
<th>i cooperates</th>
</tr>
</thead>
<tbody>
<tr>
<td>j defects</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>j cooperates</td>
<td>2</td>
<td>-1</td>
</tr>
</tbody>
</table>

a) For each scenario, what is each agent’s preference ordering for the outcomes? (4 marks)

b) For each scenario, which non-mixed strategies (if any) are dominant for the players? (4 marks)

c) Does either scenario have any Nash equilibria? If so, what are they? (2 marks)

6. List **FOUR (4)** types of agent architecture and explain them briefly. (12 marks)

7. Under what conditions will the auctioneer receive a higher price for a good if they use a Vickrey auction as opposed to a first-price sealed-bid auction? For this problem, assume that the auctioneer does not lie and the bidders do not collude. (6 marks)

8. Imagine a multi-agent system in which all agents use the KQML communication protocol and understand the KIF language, but the agents do not all necessarily understand the same ontologies. Also, agents do not know ahead of time if other agents understand the same ontologies they do. However, there is a single translator agent (known to all
agents) that can translate KIF content using symbols from one ontology into equivalent content using symbols from another ontology. Describe a protocol that would allow all agents to exchange messages and (eventually) understand the message they receive. You should describe what performatives are needed, the format of the content of these messages, and the procedure agents use for determining which messages to send.

(8 marks)

9. Consider the pursuit task, in which four predators attempt to surround and capture a prey. Assume that the predators and prey live on a 100x100 grid, and that each can only move one square in one of the four compass directions on each round. Only one animal can occupy a square at any given time. Each predator can only see up to three squares away from it (but can see in all directions). The predators can broadcast messages to each other, regardless of distance. A prey is captured when a predator moves into its square.

a) Describe an appropriate coordination mechanism for the predators.

(4 marks)

b) Explain the rationale for your choices.

(4 marks)

You do not need to implement your solution, but it should be described at a sufficient level of detail that it could then be easily implemented by a competent programmer who is familiar with multi-agent systems.

10. Agents can be used in both business-to-customer and business-to-business "marketplace" applications. What are the issues that enable or prevent their use in these "marketplace" applications (security, data formats, ontologies, and so on)?

(10 marks)

END OF QUESTIONS