

# Multi Agent Systems Exam

232060

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*Please provide the answer to 10 questions from the 12 questions below. If you provide answers to more than 10 questions only the first 10 will be considered for your grade.*

- 1) Which of the below is *not* a key distinction between an object (in the object-oriented sense) and an agent (in the multiagent system sense)?
  - a. agents have stronger autonomy than objects, since they can decide for themselves whether or not to perform an action
  - b. agents are capable of flexible behaviour, and the standard object model has nothing to say about such types of behaviour
  - c. each agent is assumed to have its own thread of control, and a multiagent system is thus inherently multi-threaded, whereas this is not necessarily so in an object-oriented system.
  - d. all three of the above statements are valid distinctions between objects and agents.
  
- 2) Agents can be seen as intentional systems. The term 'intentional stance' applies here and means:
  - a. that we can explain the agent's behaviour in terms of folk-psychological terms like its beliefs, desires, and intentions, wishes, goals, hopes etc.
  - b. that the agent is designed in terms of beliefs, desires and intentions (BDI).
  - c. Both a. and b. are correct.
  - d. Neither a. nor b. is correct.
  
- 3) Agent oriented programming (AOP) is based on the idea that
  - a. it makes sense when the abstraction mechanism for building complex systems matches the abstraction mechanism people use for representing the properties of these systems
  - b. in a sense one can see agents as objects, and as such, object-oriented design methodologies can be reused for MAS design
  - c. because agents operate with a certain amount of autonomy, it takes away some of the explicit programming effort that is necessary in other programming paradigms, such as object-oriented programming
  - d. for some complex systems (e.g., air traffic control systems), it makes sense to use agents rather than building one big complex piece of software to tackle the problem.
  
- 4) Which state of affair is the strongest motivator for taking action?
  - a. Belief
  - b. Desire
  - c. Intention
  - d. Goal
  
- 5) Below are two situations that might occur in rational agents. Which of them is an acceptable situation for a rational agent, and which of them is not rational (i.e., should not occur in a rational agent)?
  - I. Having an intention to achieve  $\phi$  while believing that you will not bring about  $\phi$

- II. Having an intention to achieve  $\phi$  without believing that  $\phi$  will be the case
- Both I and II are acceptable situations in a rational agent.
  - I is an acceptable situation, but II is not rational.
  - I is not rational, but II is an acceptable situation.
  - Both I and II are not rational.

- 6) Which of the following are *not* specified by a task environment?
- the properties of the system the agent will inhabit
  - the criteria by which an agent will be judged to have either failed or succeeded in its task
  - the agent function that determines how perceptions in the environment lead to task-related actions
  - all the above are specified in a task environment

- 7) Willie the house robot is asked to fetch a beer for its owner. It drives off, returns with a beer but smashing it on the ground instead of handing it over. It reasons: "I've kept my commitment as specified. Commitments must be dropped only when I have achieved them, or when I think they are impossible to achieve. By smashing the bottle, the commitment became unachievable." This example illustrates that the commitment strategy implemented in Willie is a strategy of:
- blind commitment
  - single-minded commitment
  - open-minded commitment
  - close-minded commitment

- 8) A designer develops a horizontally layered hybrid agent for a computer game, modelling the behaviour of a little boy. He implements a (lower-level) reactive layer and a (higher-level) planning layer. In the game, the little boy sees a spider. The reactive layer proposes the action to scream in fear, whereas the planning layer proposes the action to pick up a comic book to smash the spider. What will the boy do?
- He will start screaming. Since lower level layers inhibit higher level layers, the action proposed by the lower level layer has precedence.
  - He will pick up the book. Since higher level layers represent more intelligent and effective behaviour (at the cost of computation), the action proposed by the higher level layer has precedence.
  - He will start screaming *and* pick up the book. Because the actions proposed by the different layers do not contradict each other, they can be executed in parallel.
  - There are no rules as to precedence of actions proposed by different layers. The designer needs to make choices based on his own considerations about what makes sense.

- 9) Let us suppose that the agents have utility functions defined as follows:  
 $u_i(\omega_1) = 1, u_i(\omega_2) = 1, u_i(\omega_3) = 4, u_i(\omega_4) = 4, u_j(\omega_1) = 1, u_j(\omega_2) = 4, u_j(\omega_3) = 1, u_j(\omega_4) = 4.$   
 Consider the following subsets of outcomes:  $\Omega_1 = \{\omega_1, \omega_2\}, \Omega_2 = \{\omega_3, \omega_4\}$ . Which of the following statements is true.
- $\Omega_1$  dominates  $\Omega_2$  for agent  $i$
  - $\Omega_1$  dominates  $\Omega_2$  for agent  $j$
  - $\Omega_2$  dominates  $\Omega_1$  for agent  $i$
  - $\Omega_2$  dominates  $\Omega_1$  for agent  $j$

- 10) Consider the following payoff matrix. Which pairs of strategies are in Nash equilibrium?  
 (Given that it is possible that more than one pair of strategies could be in Nash equilibrium, more than one answer might be correct. If you think this is the case, your answer should list all the pairs.)

	i defects	i cooperates
j defects	3 3	5
j cooperates	3 0	2
	5	2

- a. (D,D)
- b. (D,C)
- c. (C,D)
- d. (C,C)
- e. none of the above

11) Which definition is correct?

- a. English auctions are first-price, open-cry, ascending auctions
- b. English auctions are first-price, closed-cry, descending auctions
- c. English auctions are first-price, open-cry, ascending auctions
- d. English auctions are second price, open-cry, descending auctions

12) In FIPA-ACL, the performative “query-if” is defined as “This performative allows one agent to ask another whether or not some specific statement is true or not”. To what class of speech acts does “query-if” belong?

- a. Directives
- b. Commissives
- c. Expressives
- d. Declarations