

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
APRIL EXAMINATIONS 2009

SUBJECT: ARTIFICIAL INTELLIGENCE
CODE: SCS4101

INSTRUCTION TO CANDIDATES

Answer **FIVE** questions.
All questions carry equal marks i.e. twenty marks.

Time: 3 hours

QUESTION ONE

- a) Convert each of the following English sentences into First-order predicate Calculus, using reasonably named predicates, functions, and constants. If you feel a sentence is ambiguous, clarify which meaning you are presenting in logic.
- i) Everyone of African descent belongs to the African Nation. [1]
 - ii) Not everyone is a computer expert, but everyone is computer literate. [1]
- b) Consider the following two first-order logic sentences:
- $\exists x \text{ biscuits}(x) \rightarrow (\exists y \text{ child}(y) \wedge \text{likes}(x,y))$ (i)
 - $\exists y \text{ biscuits}(y) \wedge (\exists x \text{ child}(x) \rightarrow \text{likes}(x,y))$ (ii) [1]

Give the English description of what these two sentences mean, including how they differ.

QUESTION TWO

Agents

- a) Define a "rational agent" and discuss the four basic kinds of agent programs. [8]
- b) Discuss the components of a learning agent. Your answer must include a graphical model. [12]

QUESTION THREE

- a) Give an example of Universal Instantiation [5]
- b) Give an example of Existential Instantiation [5]
- c) What are neural nets and how do they function? [10]

QUESTION FOUR

- a) Consider the following agents and give their percepts, actions, goals and environments

Agent Type	Percepts	Actions	Goals	Environment
Chess with a clock				
Chess without a clock				
Poker				
Backgammon				
Taxi driving				
Medical diagnosis system				
Image-analysis system				
Part-picking robot				
Refinery controller				
Interactive language tutor				

[10]

- b) Consider the following environments and say whether or not (by inserting 'yes' or 'no' in the appropriate cell) they are accessible deterministic static or discrete.

Environment	Accessible	Deterministic	Episodic	Static	Discreet
Chess without a clock					
Chess with a clock					
Backgammon					
Taxi driving					
Medical diagnosis system					
Image-analysis system					
Part-picking robot					
Refinery controller					
Interactive language tutor					

[10]

QUESTION FIVE

- a) What is case-based reasoning and how does it contrast to rule-based reasoning? [10]
- b) What is inductive learning? [10]

QUESTION SIX

- a) Discuss ontological engineering and the steps involved in the construction of an ontology. [10]
- b) Give an example of De Morgan's rule for quantified sentences. [5]
- c) What are genetic algorithms? Formulate an example? [5]

QUESTION SEVEN

Discuss the following search strategies. For each one of these you must give a definition, drawing and prolog programme :

- i) Breadth-first [5]
- ii) Depth-first [5]
- iii) Best-first [5]
- iii) Agenda-driven [5]

END OF QUESTION PAPER

