2910310 Artificial intelligence

Examiner's report: Zone A

Question 1

Part a). Although candidates were on the whole able to explain the terms: percepts, actions, goals and environment as used in work on intelligent agents, relating these to specific examples seemed to be beyond too many.

Parts b) and c). The classification of agents in terms of their workings should be well within the capabilities of candidates at this level. However some seemed unsure of the distinctions between the four not exclusive classes (reflex, programs with internal states, goal based and utility based) and many were unable to give examples.

Question 2

In Question 2 a) although many candidates were able to give reasonable explanations of the concept of search, many answers were not as clear as might be hoped. It was often unclear whether the candidate saw the potential correspondence between any given problem and a derived search problem (i.e. that every problem can be written as a search problem).

For part b) candidates were to explain the different search techniques that could be used for looking for a name in paper-based telephone directory. Although there were many good answers, other candidates failed to mention the differences between directed and undirected search.

Answers to part c) were disappointing. The terms: initial state, search state, operator, goal test and path cost function are fundamental to any discussion of search and a surprising number of candidates were not fully able to give simple accounts of them. Goal test and path cost in particular were poorly addressed.

Sketching an algorithm for a breadth first search is bookwork and can easily be answered by those knowing the simple generic search algorithm. It is important to have mechanisms for dealing with loops in search space and this was often forgotten in the answers given for part d).

Part e). Their space and time complexity and their status as optimal, complete etc are important properties of search algorithms. Most candidates were able to give these for breadth first search though it was not always clear whether they understood why the values are so.

The example of searching a phone directory, in part f), should have been a good one for candidates to display their knowledge of search techniques. A surprising number of them failed to mention binary or directed searches as good candidates for a phone directory.

Question 3

Part a) on the validity and satisfiability of a sentence in a logic is completely bookwork, and was generally well answered.

The shortcomings of Prepositional Calculus and the use of First Order Propositional Calculus to overcome these difficulties was the content of part b). Good answers included notes on arguments, variables and quantifiers.

Part c) was straightforward for those candidates who are methodical in their presentation of truth tables by starting at all False (or 0's) and ending on all True (1's). Those who do not do this often omit cases and thus lose valuable marks.

A semantic tableau is preferable to Boolean algebra when dealing with complex expressions requiring a deep proof. Candidates were not always able to express their ideas on this clearly.

Although requiring some thought, part e) was quite straightforward for those candidates who practised expressing English statements as FOPC terms. However there were indications that those who did not practise had difficulty with the quantifiers.

Statements in part e) can be considered contradictory although clearly this is only an illusion. Default logic can be used to alleviate this problem and this was known by a good number of candidates.

Question 4

In Question 4 a language is given as grammatical and lexical rules:

Parts a) and b) posed little difficulty for candidates who on the whole had no difficulty finding the sentence represented by the grammar and giving a syntactic tree for it. More taxing for some was giving an explanation of how they arrived at this sentence.

Part c) requires a simple combinatorial argument to count the number of extra sentences that are in the grammar (80 more). Most candidates were able to obtain the correct number.

The addition of the three extra rules in part d) increases the number of sentences without limit (though they may not be very interesting sentences) and adds to the already present ambiguity in the language. Many candidates were unable to put these ideas into words.

In part e) some candidates had difficulty giving examples of the problems inherent in the language, showing that familiarity with using sets of rules had not been learnt by some.

Pragmatics and an explanation of it was the hoped for answer to part f). Although many candidates saw the problem few were able to name it!

Question 5

Part a. Candidates were on the whole able to give a reasonable account of arguments against machines being intelligent although this was often a little less deep than one might have hoped.

Part b. Turing argued that a machine that mimics human behaviour can be said to have real understanding and developed the Turing test as a means of determining a sufficient level of intelligence. The details of this test were well known by most candidates who answered this question, though it seemed clear that they were not used to separating their own opinions from those that they have learnt about.

It is in part c) that candidates were given the opportunity to give opinions. Answers to this part were a little disappointing. Suggestions for current applications that show promising progress towards AI were not always clearly AI related! As is often the case candidates were less able to give reasons for their choice.

Other answers, though competent, often lacked detailed knowledge of current applications. It would be good to see some evidence of candidates 'reading around' their subject but this was quite scarce.