THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

FINAL EXAMINATION 2013/2014

BACHELOR OF TECHNOLOGY PROGRAMME – COMPUTER ENGINEERING

ECX6240 – Knowledge Engineering

Date: 20th August 2014 **Time: 09.30 – 12.30 P.M.**

This paper contains **EIGHT (8)** *questions on 4 pages. Answer* **ONLY FIVE (5)** *questions*:

Q1

i. Express the following English sentences in First Order logic (predicate logic) using standard notations.

a). No Dog bites a child of its owner. (3 marks)

b). Any basketball player from 'Team A' is better than some basketball player from 'Team B'. (4 marks)

ii. Write Prolog codes for the following tasks.

a) Find the n^{th} element of a list.
e.g. find_n([5,3,7,9,10],4,X) should give X=9 (3 marks)

b) Given two positive integers, X and Y, write rules according to the criteria given below to find their greatest common divisor D.
1. If X and Y are equal then D is equal to X.
2. If X < Y then D is equal to the greatest common divisor of X and the difference Y – X.
3. If Y < X then do the same as in case (2) with X and Y interchanged.

(6 marks)

c) Write a predicate *posDelete* that deletes an element in position from a given list and returns the new list.
e.g. posdelete(4,[a,b,c,d,e,f],L) should give L = [a,b,c,e,f]. (4 marks)

Q2

i. Under which circumstances is the use of Genetic algorithms to solve a problem is beneficial? Discuss with examples. (5 marks)

ii. Explain why diversity is important when using genetic algorithms to solve problems. (4 marks)

iii. Cross over is a critical feature of genetic algorithms. Briefly explain why it is so. (4 marks)

iv. Consider the problem given below and discuss how you would find a solution using genetic algorithms.

You are given a list of 100 items, each with a weight and a utility value. The problem is to select an optimal set of items from the list, up to 6 items total, such that the weight is less than 20 pounds, and the utility is maximized. (7 marks)

Q3. Consider the following relationships given in sentences.

Tweety and Sweety are birds. Tweety has a red beak. Sweety is Tweety's child. A crow is a bird. Birds can fly.

i. Represent the above relationships by a Semantic Network. (8 marks)

ii. Use the frame-based representation for the above sentences. (7 marks)

iii. Explain the advantage of using the frame-based representation over the rule-based representation for developing Expert systems. (5 marks)

Q4.

i. Explain the differences and similarities between depth-first search and breadth-first search. Give examples of the kinds of problems where each would be appropriate. (4 marks)

ii. Explain what is meant by the terms: *complexity*, *completeness* and *optimality* in relation to search methods with examples. (6 marks)

iii. Explain the A* algorithm by giving two real world examples where it can be applied. (5 marks)

iv. Explain how does search engines makes use of search using a real world example.

(5 marks)

Q5.

i. Describe with examples three (03) methods of knowledge acquisition. (6 marks)

ii. If a computer passes the Turing test, what would that prove? Describe the conditions that need to be observed in setting up the test. (5 marks)

iii. Explain different methods of conflict resolution that can be used in rule based expert systems. (5 marks)

iv. Why does the search in game-playing programs always proceed forward from the current position rather than backward from a goal state? (4 marks)

Q6.

i. Describe how Fuzzy sets differ from traditional sets. (4 marks)

ii. Explain what is meant by Defuzzification using an example. (5 marks)

iii. Describe what is meant by a fuzzy inference system. (6 marks)

iv. Describe how fuzzy logic can be applied in the field of medicine. (5 marks)

Q7.

i. What is an intelligent agent? (2 marks)

ii. Describe how you can embed intelligence to an agent in a given environment. (5 marks)

iii. "A computer virus is a kind of intelligent agent". Discuss this statement describing different agent properties that computer virus should have. (5 marks)

iii. Briefly describe 3 ways that communication could be done among agents. (4 marks)

iv. Explain what is meant by the following terms in the context of agents?

a. autonomy
b. learning (4 marks)

Q8.

i. Explain the difference between supervised and unsupervised learning in Artificial Neural Networks (ANN). When might each be useful? (4 marks)

ii. Explain the limitations of a perceptron. What kind of problems can they solve? Give few real world examples. (5 marks)

iii. Briefly describe how you decide the number of hidden layers and nodes for a neural network. (5 marks)

iv. Explain why ANNs can be used for modeling below given problems. Your answer must include relevant features of ANN that makes it most suitable.
   a. Recognition of hand written characters.
   b. Agricultural crop predictions based on relevant agricultural data. (6 marks)