UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2010/2011 – 3rd Year Examination – Semester 5

IT5303: Intelligent Systems

Structured Question Paper
13th March 2011
TWO HOURS

To be completed by the candidate

BIT Examination Index No: .....

Important Instructions:

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **16 pages**.
- Each question carries equal marks.
- **Answer all 4 questions**.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.
- **Calculators are not allowed.**

Questions Answered

Indicate by a cross (X), e.g. [X] the question numbers of the questions answered.

To be completed by the candidate by marking a cross (X).	1	2	3	4	
To be completed by the examiners:					

Index No: ……...

1) (a) Briefly describe what is meant by weak AI.

(02 marks)

ANSWER IN THIS BOX

(b) Name and briefly describe the famous experiment which promotes the philosophy of weak AI.

(03 marks)

ANSWER IN THIS BOX

(c) Define the term 'Ideal Rational Agent' using an example.

(02 marks)

ANSWER IN THIS BOX

(d) Consider an intelligent agent involved in playing chess. Define the environment of the agent using relevant *environment variables*.

(10 marks)

ANSWER IN THIS BOX

(e) (i) What is meant by a context free grammar? What is its use?

(04 marks)

ANSWER IN THIS BOX

(ii) Draw the parse tree for the sentence '**Every man loves a pretty woman',** using the following grammar:

sentence → noun phrase + verb phrase.
verb phrase → verb + noun phrase.
noun phrase → determiner + noun.
noun → adjective + noun.
determiner → a.
determiner → every.
noun → man.
noun → woman.
adjective → pretty.
verb → loves.

(04 marks)

ANSWER IN THIS BOX

2) (a) Code the following statements in Prolog.

(i) John loves Mary.
(ii) Mary loves John if Mary is the mother of John and John loves her.
(iii) Some one is an ancestor of another if he or she is either a parent or a parental predecessor of the other.

(06 marks)

ANSWER IN THIS BOX

(b) Consider the following Prolog code fragment.

```
fun1([],[]).
fun1([H|T],L2):- fun1(T,L),fun2(L1,[H],L2).
fun2([],L,L).
fun2([H|T],L2,[H|Y]):- fun2(T,L2,Y).
```

What will be the output produced by the above program to the following query?

```
Q : fun1([a,b,c,d,e,f,g],X).
```

(04 marks)

ANSWER IN THIS BOX

(c) Name and briefly explain the 4 criteria which define the performance of a search algorithm.

(04 marks)

ANSWER IN THIS BOX

(d) Consider a bus service where busses travel between towns. The distances between the towns where the bus service operates are tabulated below.

Towns		Distance in km
A	F	7
B	E	3
B	C	10
C	A	12
C	E	8
A	E	6
D	B	9
D	C	9

(i) Name a suitable search technique to find the least distance route from A to D given the information above.

(01 mark)

ANSWER IN THIS BOX

(ii) Explain why you think the search technique you named in part (i) above is the best to be used.

(03 marks)

ANSWER IN THIS BOX

(iii) Use the search technique you named in part (i) above to find the cities to be visited for a bus from A to D.

(02 marks)

ANSWER IN THIS BOX

(iv) What extra information do you think would have assisted the search for a better route?

(02 marks)

ANSWER IN THIS BOX

(v) Name a search technique that can be used to find a better route provided the extra information you stated in part (iv) above has been given.

(01 mark)

ANSWER IN THIS BOX

(vi) Explain how a better solution could have been found using the search technique you named in part (v) above.

(03 marks)

ANSWER IN THIS BOX

3) (a) Scripts are a knowledge representation technique that can be used to represent eventual knowledge.

Consider the following description and complete the script that follows.

'A lecturer enters for a class to deliver a lecture. The class is equipped with desks, chairs, a white-board, marker, computer and projector. The students are provided handouts and are ready to follow the lecture. Before attending the lecture, the students have to register for the lecture by paying a registration fee to the registrar. The students must have completed several prerequisite lectures before following the lecture.'

(06 marks)

ANSWER IN THIS BOX

Entry Conditions	
Result	
Props	
Roles	
Scenes	
Track	

(b) List 2 advantages and 2 disadvantages of using Predicate Logic as a knowledge representation technique.

(04 marks)

ANSWER IN THIS BOX

(c) Express the following sentences in predicate logic.

(i) All mammals drink milk.
(ii) There is a fortune behind every successful man.
(iii) Not all birds may sing but they all do fly.

(06 marks)

ANSWER IN THIS BOX

(d) A Semantic Network is a knowledge representation technique used to code factual knowledge.

Draw a Semantic Network to represent the following facts.

"Musical instruments which produce different sounds can be categorized into different groups. The Percussion Family is one such group which represents instruments such as drums and cymbals. The String Family is another such group which represents instruments such as the violin, viola and cello. The Wind Family represents instruments such as flutes and saxophones which are blown to produce sounds."

(04 marks)

ANSWER IN THIS BOX

(e) Define the term **Expert System** using a suitable example.

(02 marks)

ANSWER IN THIS BOX

(f) Briefly describe the 3 main components of an Expert System.

(03 marks)

ANSWER IN THIS BOX

4) (a) Compare and contrast the most fundamental features that are common to the human brain and Artificial Neural Networks (ANNs).

(05 marks)

ANSWER IN THIS BOX

(b) Outline the role of the activation function in the error back-propagation algorithm and state any properties that it should have in order to be used in the above algorithm.

(05 marks)

ANSWER IN THIS BOX

(c) Explain how an unsupervised learning algorithm learns a concept or updates its knowledge about a domain using training data.

(05 marks)

ANSWER IN THIS BOX

(d) Explain how Kohonen's self-organizing map (SOM) algorithm can be used as a classification tool.

(05 marks)

ANSWER IN THIS BOX

(e) What is meant by generalization ability of a neural network, and why is it important?

(05 marks)

ANSWER IN THIS BOX

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