RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
ThirdYear - Semester I Examination – Nov/Dec 2016

ICT 3212 – INTRODUCTION TO INTELLIGENT SYSTEMS

Time:Two hours

Instruction to candidates

- This is a closed book examination.
- There are FIVE (5) pages in the question paper.
- Question paper consists of FIVE (5) questions.
- Answer any FOUR (4) questions.
- All questions carry equal marks.

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1. Question 01

   a) Give two definitions of Artificial Intelligence. (4 marks)

   b) State four properties of Intelligence. (4 marks)

   c) Comment on the expression. "Machines cannot think, so Machines cannot be Intelligent." (5 marks)

   d) What are the five eras of Artificial Intelligence? (5 marks)

   e) Briefly explain one of the mentioned eras in part 1(d) (3 marks)

   f) List down four application areas of Artificial Intelligence. (4 marks)

   (25 marks)

2. Question 02

   a) What is a Knowledge Based Agent? (3 marks)

   b) Let p stand for the proposition "Nimal study hard" and q for "Nimal pass the exam". Express the following as natural English sentences. (5 marks)

i. $\neg p$

ii. $p \wedge q$

iii. $p \Rightarrow q$

iv. $\neg p \Leftrightarrow \neg q$

v. $\neg p \vee (p \wedge q)$

c) Consider the following (S1,S2,S3,S4) propositions in a Knowledge Base

Key: A: Sandun goes to the fair today

B: Kamal goes to the fair today

C: It Rains today

S1: Sandun or Kamal doesn't go to the fair today

S2: Sandun doesn't go the fair if and only if it rains today

S3: It doesn't Rain today.

i. Represent the above sentences S1, S2 and S3 sentences using the key provided (4 marks)

ii. Using the following inference methods prove that "Sandun goes to the fair today" (9 marks)

1. Truth Table
2. Natural Deduction

d) Explain two drawbacks of Propositional Logic Using suitable examples. (4 marks)

(25 marks)

3. Question 03

a) Consider the following Knowledge Base

Jack owns a dog.

Every dog owner is an animal lover.

No animal lover kills an animal.

Either Jack or Curiosity killed the cat, who is named Tuna.

i. Represent the above sentences in First Order Logic (5 marks)

ii. Convert the sentences in part (i) to Conjunctive Normal Form (5 marks)

iii. Prove that "Curiosity killed Tuna" by Resolution Method. (6 marks)

b) Consider the following Knowledge Base and Represent the given sentences in prolog (5 marks)

Mary likes Apple

Mary likes Banana

John likes anything that Mary likes

John likes anyone who likes Apple

John likes anyone who likes themselves.

c) How to query the following questions in prolog regarding the above knowledge base? (4 marks)

i. Does John Like Banana?

ii. Does John Like Mary?

iii. Does Mary Like Pineapple?

iv. Does Mary Like John?

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(25 marks)

4. Question 04

a) What is called an "epoch" in Artificial Neural Networks (3 marks)

b) List four mostly used activation functions in ANN. (4 marks)

c) Immerging Tech Company has designed an electrical fan to change its speed automatically according to the environmental conditions. Temperature, Humidity and the speed of the fan are categorized as shown in Table 1, Table 2 andTable 3 respectively.

Temperature (°C)	Category
23.00 -25.99	Moderate
26.00 -28.99	Hot
29.00 -34.99	Very Hot

Table 1

Humidity Level	Category
0 -5	Low
5 -10	Moderate
10 -15	High

Table 2

Speed (rpm)	Category
0 -60 (average 30)	Low
60 – 120 (average 90)	Moderate
120 – 180 (average 150)	High

Table 3

Based on these categories following rules in Table 4 are applied to decide speed of the fan. Average of speed category is taken as the speed value.

Humidity	Temperature		
	Moderate	Hot	Very Hot
Low	Low	Moderate	Moderate
Moderate	Low	Moderate	High
High	Moderate	High	High

Table 4

i.) Discuss the disadvantages of the above design providing suitable situations based on above categories. (6 marks)

ii.) Provide a suitable AI technique to address the disadvantages mentioned in part (a). (2 marks)

iii.) Clearly mention membership functions for inputs and outputs according to the technique you suggested in part (b). (5 marks)

iv.) Propose an appropriateFuzzy Associative Memory (FAM) Rule set for your solution. (5 marks)

(25 marks)

5. Question 05

a) Briefly explain the differences between Uninformed and Informed Searching Algorithms using suitable examples. (5 marks)

b) Give two example searching algorithms each for Uninformed Search and Informed Search. (4 marks)

c) Given in Figure Q5 and Table 5 is an example map of Germany and a table of Straight Line Distances from each city to Frankfurt respectively.

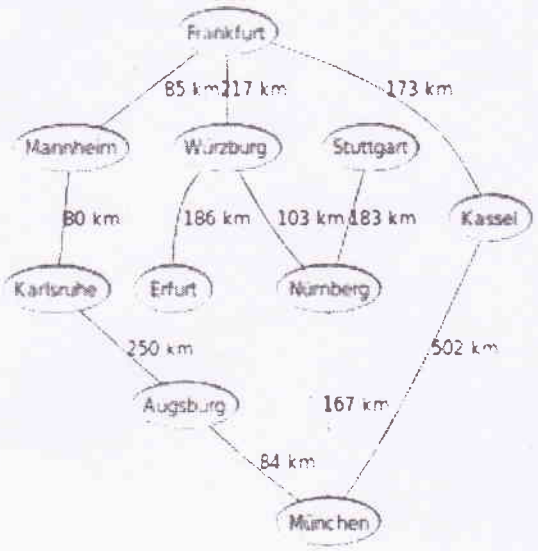

Figure Q5

Mannheim	85
Wurzburg	217
Stuttgart	90
Kassel	150
Nurnberg	230
Erfurt	310
Karlsruhe	110
Augsburg	350
Munchen	380

Table 5

If the Straight Line distance is considered as the heuristic Function Find the optimal path from Munchen to Frankfurt applying the following search Algorithms

i.) Greedy Search (8 marks)

ii.) A* Search (8 marks)

(25 marks)

END