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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES
B. Sc (General) Degree
Third Year – Semester I Examination – March/April 2014
COM 3303 – ARTIFICIAL INTELLIGENCE

Answer Four questions. Time allowed: three hours.

Calculators are provided.

1.

(a) Provide a definition for "Artificial Intelligence".

[10 marks]

(b) Name three eras of the history of Artificial Intelligence. Mention two important aspects considered during each era.

[10 marks]

(c) Describe the "Turing Test".

[30 marks]

(d)State two drawbacks of the "Turing Test".

[20 marks]

(e) Provide a solution to overcome one of the above mentioned drawbacks.

[10 marks]

(f) Comment on the following statement, justifying with rational arguments.: "Machines are not Intelligent because machines can not think".

[20 marks]

2.

(a) Consider the following propositions in a Knowledge Base:

S1:Rani or Kamal don't go to school today.
S2: Kamal don't go to the school if and only if it rains today.
S3:It doesn't rain today.

(i)Represent above sentences in Proposition Logic.
(ii)Using following inference methods prove that Rani doesn't go to the school:

- Truth Tables
- Resolution Method

[50 marks]

(b) Explain two drawbacks of Proposition Logic using an example.

[12 marks]

(c) Explain how to overcome the above mentioned drawbacks using First Order Logic (FOL).

[12 marks]

(d)Represent the following sentences in FOL

(i)Nalika is a teacher.
(ii)Nalika likes all students.
(iii)Sarath likes every follower that Kalani likes.
(iv) There are good students.

[26 marks]

3.

(a) Briefly explain followings :

(i) Artificial Neuron
(ii) Activation function
(iii)Artificial Neural Network (ANN)
(iv) Hidden layer [20 marks]

(b)Provide an algorithm for training a single layer ANN. [20 marks]

(c)Apply above algorithm for training an artificial neuron with threshold activation function for a one epoch to act as an two input OR gate. You can consider all possible inputs and outputs as the training set. [25 marks]

(d) Student wants to identify objects (moon, star, planets, etc.) in the night sky from images of night sky. For each pixel in the image 11X11 grid is conceded such that the pixel is in the middle of the grid (**Figure 1**). All pixels will be considered except the pixels in the image border with 5 pixel width. It is required to decide whether a selected pixel belongs to an object or not using an ANN. Each pixel has three values between 0 and 255 for red, green and yellow colors. Provide a structure for the ANN with one hidden layer with 8 neurons. Clearly mention inputs, outputs and hidden layer in a diagram. [35 marks]

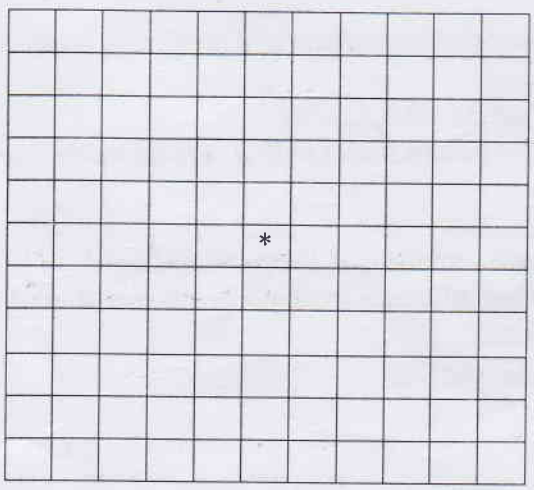

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Figure 1

4.

(a) Give an example operation for each of the following Fuzzy Logic operation.

(i) OR

(ii) AND

(iii) NOT

[15 marks]

(b)

(i) State properties of T-Norms and S-Norms

(ii) State whether following mathematic binary operators belong to T-Norm or S-Norm . If operators neither belongs to S-Norm nor T-Norm, mention the reasons based on the properties mentioned in 4 (b) i.

- Min(a,b) -minimum of a and b
- a+b -addition of a and b
- a/b -division of a and b
- a+b-(a*b)

[35 marks]

(c)"Modern Tech" company want to recruit young people with good academic qualifications. They are planning to evaluate applicants based on total marks according to the criteria defined below:

Class	Marks	GPA range
1st Class	25	Greater than 3.7
2nd Class Upper	20	Between 3.5 and 3.7
2nd Class Lower	15	Between 3.3 and 3.5
Pass	10	Less than 3.3

Table 1

Age group	Marks
20-25	10
25-30	7
30-35	4

Table 2

(i) Identify drawbacks of above approach.

(ii) Provide Fuzzy Logic based solution to overcome the above mentioned drawbacksin 4 (c) i. Clearly mention membership function for inputs and outputs and Fuzzy Rules.

[50 marks]

5.

(a)Mention two Informed and Uninformed Searching algorithms.

[12 marks]

(b) Explain the reason for using Depth First Search in Prolog instead of Breath First Search.

[10 marks]

(c)
(i) Briefly explain the Hill Climbing Algorithm.
(ii) Apply Hill Climbing Algorithm to solve 8-puzzel problem given below (**Figure 2 and Figure 3**). Clearly mention each step. You can assume suitable Heuristic Function to measure the cost to the goal.

3	1	2
4		5
6	7	8

Initial state
Figure 2

	1	2
3	4	5
6	7	8

Goal state
Figure 3

(iii) Mention advantages and disadvantages of Hill Climbing Algorithm.

(iv) How would you minimize one of above mentioned disadvantages in 5 (iii)?

[58 marks]

(d) State steps involved in Genetic Algorithms using a suitable example.

[20 marks]