



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. Degree in Applied Sciences
Third Year – Semester I Examination – Oct/Nov 2015

COM 3303 – ARTIFICIAL INTELLIGENCE

Answer **FOUR** questions only.

Time allowed: 3 Hours.

- 1.
- (a) Provide two popular definitions for Artificial Intelligence. [10 marks]
- (b) Select more suitable one of above definitions by providing valid reasons. [12 marks]
- (c) Briefly explain the Turing Test. [15marks]
- (d) Mention two drawbacks of the Turing Test. [12 marks]
- (e) Explain a techniques that can be used to overcome one of above mentioned drawback in the section (d). [12 marks]
- (f) Artificial Intelligence has strong link with other disciplines. Describe this using suitable examples. [15 marks]
- (g) Mention Halting Problem. [12 marks]
- (h) Do you believe that Artificial Intelligence is impossible because of existence of problem such as Halting Problem? Explain your answer. [12 marks]
- 2.
- (a) Mention two problems that can be formulated as Searching Problems. [10 marks]
- (b) Formulate one of above mention problem as a Searching Problem. [10 marks]
- (c) Provide three Heuristic Functions for 8-puzzle problem. [15 marks]
- (d) Show that Greedy Best First Search can be stuck in loops using a selected initial condition of 8-puzzle problem (you can select suitable Heuristic Function). [20 marks]

(e) Mention the important property need to satisfy by a Heuristic Function in order to A* search to be optimal. Identify such a Heuristic Functions in your answer to the section (c).

[15 marks]

(f) Apply A* search to solve 8-puzzle problem given in **Figure 1** and **Figure 2**. **Figure 1** and **Figure 2** represents initial and goal status respectively.

a	b	c
	d	f
g	e	h

Figure 1

a	b	c
d	e	f
g	h	

Figure 2

[30 marks]

3.

(a) Provide equations for Artificial Neuron with Bias Value and without Bias Value.

[20 marks]

(b) Provide two problems with two inputs and one output that cannot be solved using single neuron without bias input. Assume you can only use threshold Activation Function.

[20 marks]

(c) Consider following problem:

If two input numbers have same values then output is 1.

Otherwise output is 0.

If the above problem can be solved using a single neuron with threshold Activation Function, provide neuron with suitable weight values. Otherwise mention the reason.

[30 marks]

(d) Provide equivalent single neuron for the Artificial Neural Network in **Figure 3**. Weight values are mentioned in the figure. Activation Function $f(x)$ is given below:

$$f(x) = 2 * x + 2$$

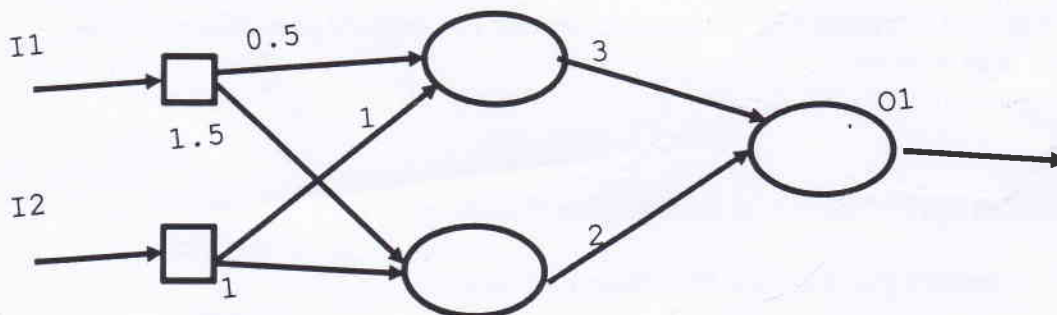


Figure 3

[30 marks]

4.

(a) Consider following as the Knowledge Base (KB):

All mammals are animals.
 All elephants are mammals.
 Raja is an elephant.
 Raja likes itself.

Discuss drawbacks of Proposition Logic representation over First Order Logic (FOL) representation of above KB.

[30 marks]

(b)

(i) Represent above KB in FOL.

[25 marks]

(ii) Convert above sentences into Conjunctive Normal Form (CNF).

[20 marks]

(iii) Prove that "some animals like some elephants " based on above KB mentioned in the section (a) using Resolution Rule.

[25 marks]

5.

(a) Describe difference between Fuzzy Logic and Proposition Logic using a suitable example.

[20 marks]

(b) Suppose you have to develop Fuzzy Inference System (FIS) for controlling the shutter speed of a camera. Shutter speed is determined by light intensity and distance to the focused object from the camera. When light intensity is high shutter speed also should increase. Shutter speed should decrease with the distance to the focused object.

(i) Identify input(s) and output(s) and provide 3 Membership Functions for each input and output with your own scale for a Sujeno type FIS.

[20 marks]

(ii) Provide five Fuzzy Inference rules that agree with above situations.

[30 marks]

(iii) Calculate output for selected inputs using your FIS.

[30 marks]