RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
Third Year - Semester I Examination - October/November 2015

ICT 3212 – INTRODUCTION TO INTELLIGENT SYSTEMS

Time Allowed: Two (02) hours.

INSTRUCTIONS TO CANDIDATES

- This paper contains five (05) questions on 07 pages. Answer **any four (04)** Questions.
- The total maximum mark attainable for this examination is 100.The marks assigned for each question and section, thereof are indicated in parentheses.
- This is a closed book examination.
- Mobile phones or any other communication devices are not permitted.
- Clearly state the assumptions you make. If you have any doubts regarding the interpretation of the wording of a question, make your own decision, but clearly state it on the script.

1.

a) Provide a definition for Artificial Intelligence.

(04 marks)

b) Discuss four properties of Intelligence using examples.

(04 marks)

c) List down four application areas of Artificial Intelligence.

(04 marks)

d) Name three Inference Algorithms that can be used for Proposition Logic and explain one of them using suitable examples.

(04 marks)

e) Explain drawbacks of Proposition Logic using examples.

(04 marks)

f) What is the Turing Test? Explain why it is much important with related to Artificial Intelligence.

(05 marks)

2.

Consider the following sentences (S1, S2, S3 and S4) as Knowledgebase(KB).

S1 : Nimali goes USA if and only if she gets Visa.
S2 : Nimali gets Visa if and only if she gets the air ticket and confirmation of accommodation.
S3 : Nimali is interested in migrating to USA.
S4 : Nimali got neither the air ticket nor confirmation of accommodation.

a) Represent above sentences (S1, S2, S3, S4) using Propositional Logic.

(03 marks)

b) Prove that "Nimali does not get Visa" using Natural Deduction method.

(07 marks)

c) Explain Full Resolution Rule and Unit Resolution Rule using suitable example.

(03 marks)

d) Convert above KB in to Conjunctive Normal Form (CNF).

(05 marks)

e) Prove that "Nimali does not get Visa" using Resolution Rule.

(07 marks)

3.

a) Explain the differences of Binary Logic and Fuzzy Logic.

(03 marks)

b) Explain the advantages of Fuzzy Logic over Binary Logic using suitable examples.

(04 marks)

c) Give example operation for OR and AND logic operations in Fuzzy Logic.

(03 marks)

d) Following Fuzzy membership functions (Figure 1, Figure 2 and Figure 3) and relevant rules (Table 1) are given below to determine the probability of choosing a job according to job interest and driving distance to work place. When the probability of interest towards the job is 3.4 and the probability of driving distance is 4.3, what are the steps in Fuzzy logic that should be followed to find the probability of choosing the job. Clearly mention any assumption you made.

(15 marks)

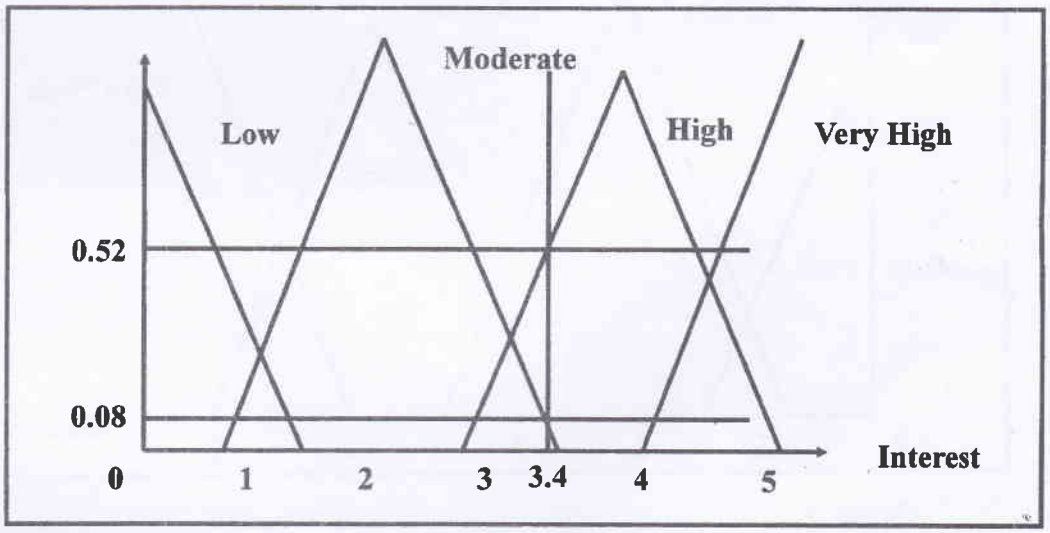

Figure 1

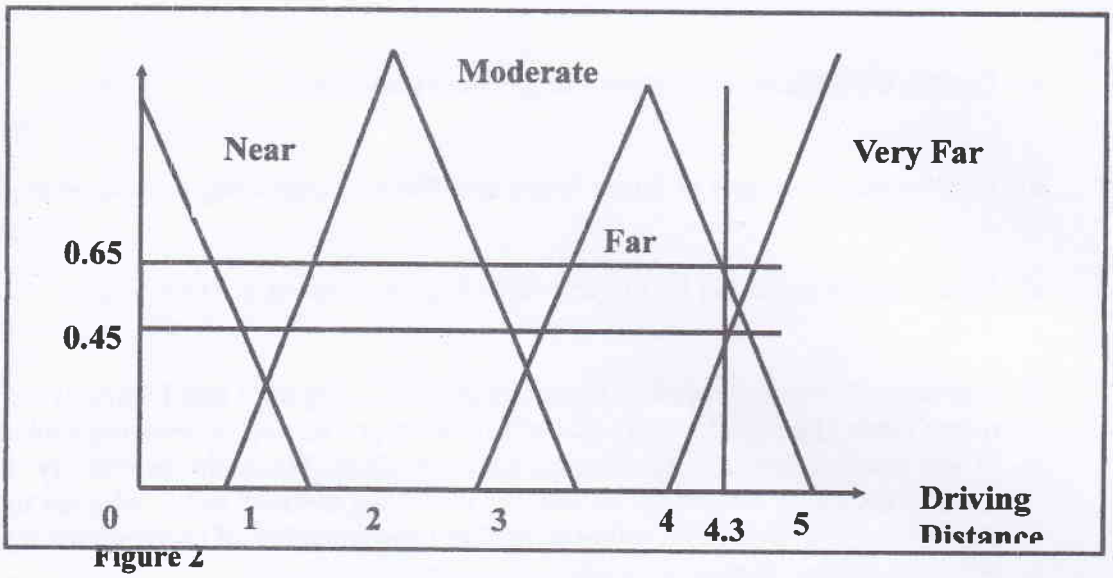

Figure 2

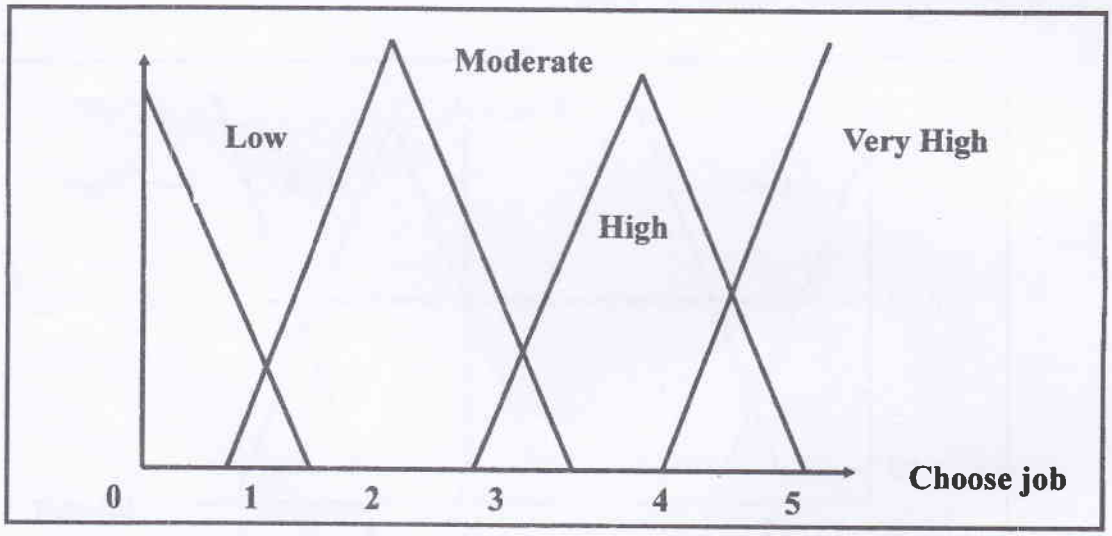

Figure 3

		Interest towards job			
Drive distance		Low	Moderate	High	Very High
	Near	Moderate	Moderate	Very High	Very High
	Moderate	Moderate	Moderate	High	Very High
	Far	Low	Low	High	High
	Very Far	Low	Low	Moderate	High

Table 1

4.

a) Discuss differences and the advantages of Heuristic (Informed) Searching Strategies over Blind (Uninformed) Searching Strategies.

(03 marks)

b) If "b" is the branching factor, "d" is the depth of the goal node, "m" is maximum level of the tree, then using four main factors of evaluating a searching algorithm, discuss the advantages and disadvantages of Depth First Searching, over Breadth First Searching. Use suitable examples.

(06 marks)

c) The following diagram(Figure 4) illustrates several cities (A,B,C,D,H,I,J,K,L,M,N,O,P,R,S,T,U and V) of a country and the cost it takes to travel from one city to another.

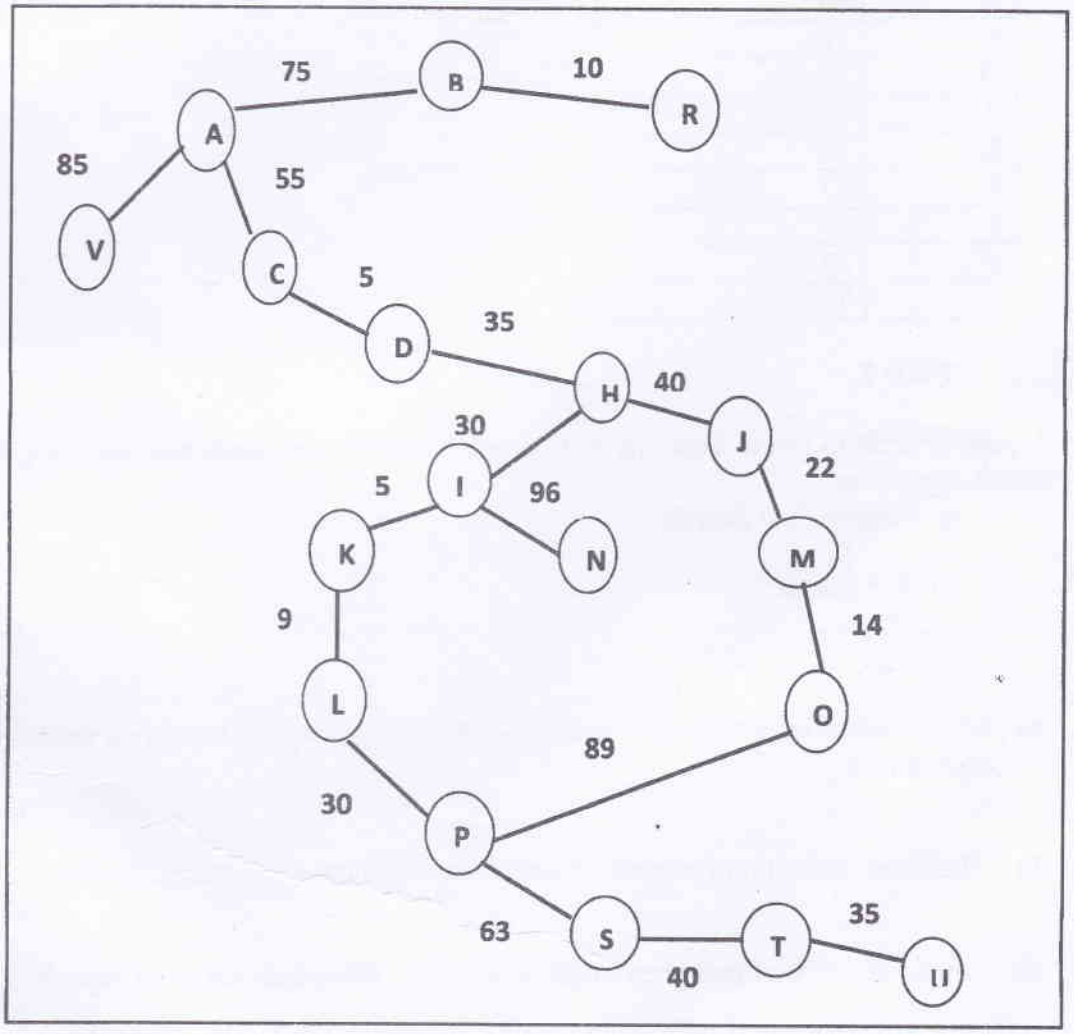

Figure 4

In route finding problem, the evaluation function : h(n) which is not over estimated the actual minimum cost, can be illustrated using following table (Table 2).

A	24
B	68
C	4
D	6
H	52
I	18
J	35
K	8
L	25
M	60
N	38
O	21
P	0
R	76
S	23
T	39
U	58
V	75

Table 2

A person needs to travel from city A to city P. Find the optimum path applying following search algorithms.

i) Greedy First Search

(08 marks)

ii) A * Search

(08 marks)

5.

a) What is called by Artificial Neural Network (ANN)? Explain using real world example applications.

(03 marks)

b) What is an Activation Function? Mention three example Activation Functions.

(03 marks)

c) Explain the steps of training a single layer ANN. What is called as an "epoch".

(03 marks)

d) Calculate the output of the following neuron (Figure 5) using Threshold Activation function.

(04 marks)

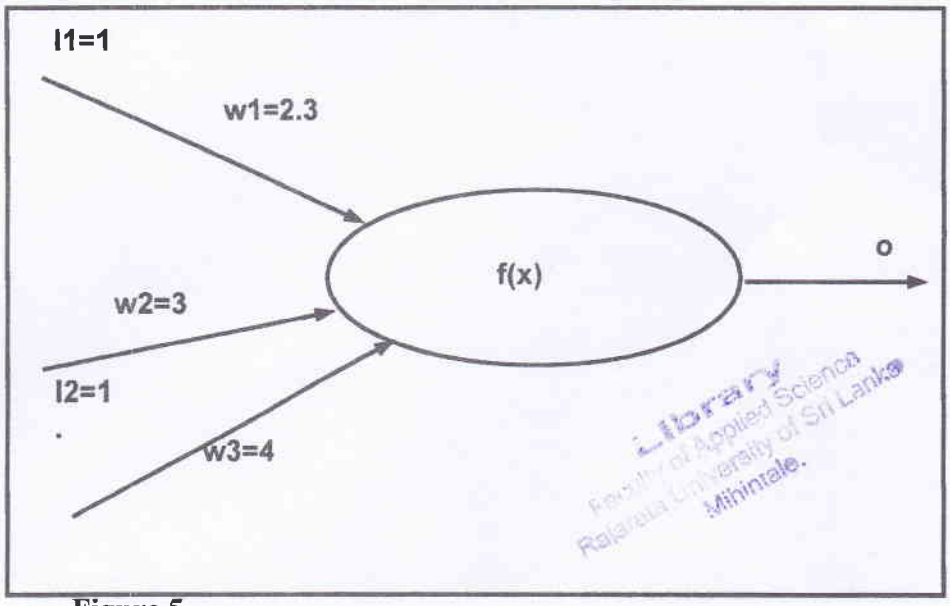

Figure 5

e) If the activation function is $f(x) = x^2+2$, output value is *4* and the learning rate (α) = 0.0001, find new weight values (w1, w2 and w3) of the above structure of ANN after one epoch (Figure 5).

(04 marks)

f) Prove that using a Bias Value, NAND gate can be represented using a single neuron. Write sample weight values for above mentioned neuron for the NAND gate.

(04 marks)

g) Why XOR gate cannot be represented using a single neuron using a bias value. Explain the answer. How would you overcome the above mentioned problem?

(04 marks)