Uva Wellassa University, Sri Lanka
End Semester Examination – February 2011
SCT 466-2 Artificial Intelligence and Robotics

Time: Two (02) Hours

Total **03** Questions
Answer **two (02)** questions

1.

a. Discuss 2 (two) applications of fuzzy logic.

b. Draw 4 (four) common shapes for fuzzy membership functions.

c. Let X = {a, b, c, d} Y = {1, 2, 3, 4}

And $\tilde{A}$ = {(a, 0) (b, 0.8) (c, 0.6) (d, 1)}

$\tilde{B}$ = {(1, 0.2) (2, 1) (3, 0.8) (4, 0)}

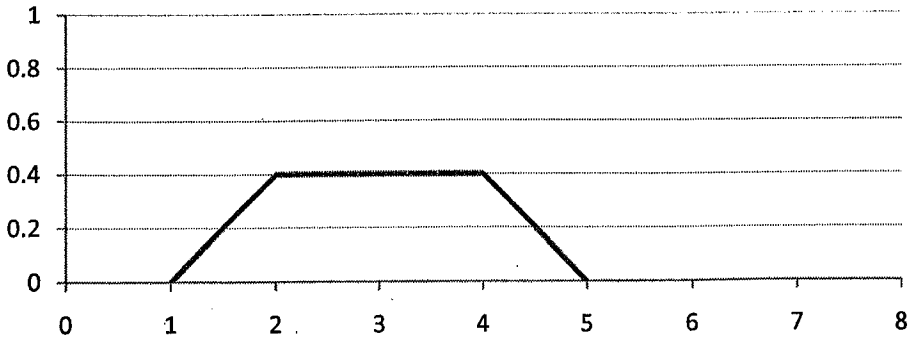
$\tilde{C}$ = {(1, 0) (2, 0.4) (3, 1) (4, 0.8)}

Determine the implication relations

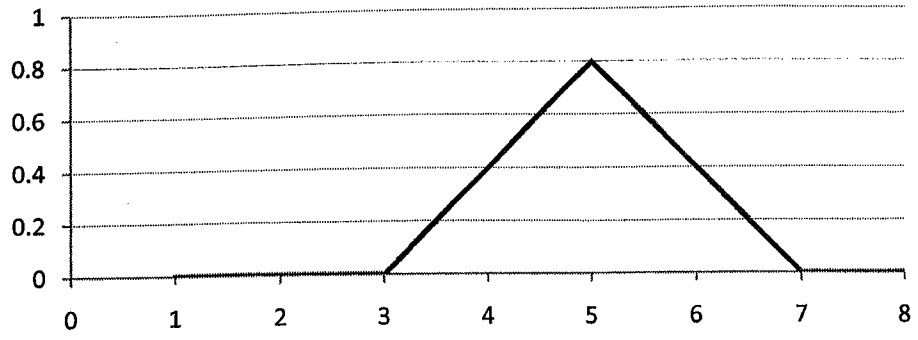
i. IF x is $\tilde{A}$ THEN y is $\tilde{B}$ where

$$\mu_{\tilde{R}}(x,y) = \max\ (\min((\mu_{\tilde{A}}(x), \mu_{\tilde{B}}(y)), 1 - \mu_{\tilde{A}}(x))$$

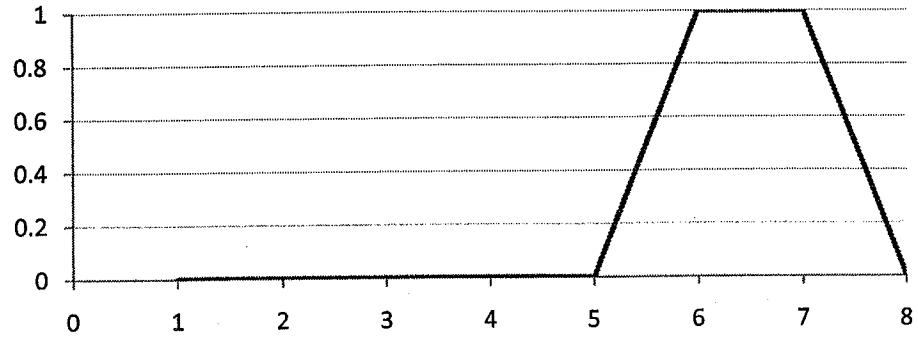
d. $\widetilde{A_1}$, $\widetilde{A_2}$ and $\widetilde{A_3}$ are three fuzzy sets as shown in Fig Q1 (a), (b) and (c).



(a) $\widetilde{A_1}$



(b) $\widetilde{A_2}$



(c) $\widetilde{A_3}$

Find the defuzzified output for this problem using centroid method and centre of sums method.

(100 marks)

2.

a. Explain where possible with sketches, how an artificial neuron mimics the behavior of a biological neuron.

b. Explain single layer feedforward network with your own example.

c. What is supervised learning and what is unsupervised learning? Give applications of these strategies.

d. You are asked to develop a vehicle number plate (with only two English letters and four digits) identification system. Discuss your proposed system giving details about inputs to the system, outputs from the system learning methods etc.

(100 marks)

3.

a. What are the applications of genetic algorithms?

b. Write the common genetic algorithm in a flow chart.

c. Discuss two encoding methods giving examples.

d. Describe two selection methods associated with genetic algorithms using examples.

e. You are asked to solve the following problem using Genetic Algorithms.

Minimize $(x_1 - 2.5)^2 + (x_2 - 5)^2$

Subject to

$$5.5x_1 + 2x_2^2 - 18 \leq 0$$

$$0 \leq x_1, x_2 \leq 5$$

Give details about encoding, fitness function, selection method etc. and discuss how you can solve this problem using genetic algorithms.

(100 marks)