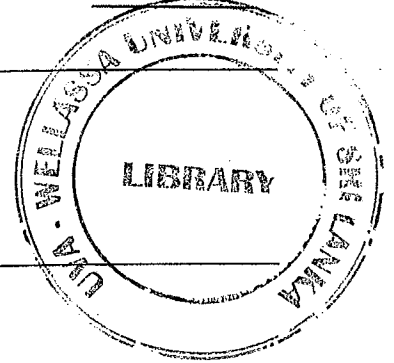


Uva Wellassa University, Sri Lanka
 Faculty of Science and Technology
 Science and Technology Degree program
 1st Semester Examination – March/April 2013



**Uva Wellassa
 University**

SCT 466-2 Intelligent Systems



Total four (04) Questions

Answer all questions.

Time: Two (02) Hours

Total mark allocation 100.

1.

a. Let A and B be fuzzy subsets of $X = \{-2; -1; 0; 1; 2; 3; 4\}$.

$$A = 0.6/-2 + 0.3/-1 + 0.6/0 + 1.0/1 + 0.6/2 + 0.3/3 + 0.4/4$$

$$B = 0.1/-2 + 0.3/-1 + 0.9/0 + 1.0/1 + 1.0/2 + 0.3/3 + 0.2/4$$

Find,

i. $A \cap B$

ii. $A \cup B$

(2 x 10 marks)

b. Draw membership functions for part (i) and (ii) in (a) above.

(2 x 10 marks)

c. Let two binary relations be $R =$ "x is considerably smaller than y" and $G =$ "x is very close to y"

$$R = \begin{pmatrix} & y_1 & y_2 & y_3 & y_4 \\ x_1 & 0.5 & 0.1 & 0.1 & 0.7 \\ x_2 & 0 & 0.8 & 0 & 0 \\ x_3 & 0.9 & 1 & 0.7 & 0.8 \end{pmatrix}$$

$$G = \begin{pmatrix} & y_1 & y_2 & y_3 & y_4 \\ x_1 & 0.4 & 0 & 0.9 & 0.6 \\ x_2 & 0.9 & 0.4 & 0.5 & 0.7 \\ x_3 & 0.3 & 0 & 0.8 & 0.5 \end{pmatrix}$$

Find,

i. the intersection of R and G means that "x is considerably smaller than y" and "x is very close to y".

ii. the union of R and G means that "x is considerably smaller than y" or "x is very close to y".

(2 x 10 marks)

- d. Consider two fuzzy relations $P =$ "x is considerable smaller than y" and $Q =$ "y is very close to z"

$$P = \begin{pmatrix} & y_1 & y_2 & y_3 & y_4 \\ x_1 & 0.5 & 0.1 & 0.1 & 0.7 \\ x_2 & 0 & 0.8 & 0 & 0 \\ x_3 & 0.9 & 1 & 0.7 & 0.8 \end{pmatrix} \quad Q = \begin{pmatrix} & z_1 & z_2 & z_3 \\ y_1 & 0.4 & 0.9 & 0.3 \\ y_2 & 0 & 0.4 & 0 \\ y_3 & 0.9 & 0.5 & 0.8 \\ y_4 & 0.6 & 0.7 & 0.5 \end{pmatrix}$$

Find the max-min composition $P \circ Q$

(20 marks)

- e. Briefly explain a fuzzy controller that you are familiar giving details of inputs and outputs to the system.

(20 marks)

2.

- a. Explain the following briefly, with reference to Genetic Algorithms.

- i. Chromosome
- ii. Encoding
- iii. Fitness function
- iv. Selection
- v. Population

(5 x 5 marks)

- b. Name four (4) types of encoding and briefly explain one application for each type.

(4 x 5 marks)

- c. Briefly explain two (2) types of selection methods that can be used with genetic algorithms.

(2 x 15 marks)

- d. What is crossover? Name two (2) types of crossover methods and explain using examples.

(25 marks)

3.

- a. Draw a biological neuron and name the most important parts.
(10 marks)
- b. What are the various activation functions of artificial neurons? Explain them schematically.
(20 marks)
- c. Explain different learning methods in artificial neural networks.
(20 marks)
- d. What is back-propagation? Briefly explain.
(20 marks)
- e. Draw and briefly explain the functions of a multilayer feedback neural network.
(30 marks)

4.

- a. Briefly explain how an artificial intelligent agent interact with its environment.
(20 marks)
- b. Consider a vacuum cleaner as an intelligent agent. Write down Performance measures, Environment, Actuators and Sensors (PEAS) for the vacuum cleaner.
(30 marks)
- c. What is autonomy of an intelligent agent?
(10 marks)
- d. Name four (4) agent types.
(4 x 5 marks)
- e. What is a multi-agent system? Explain briefly with an example.
(20 marks)