



Dept. of Computer Engineering
Final Exam, Second Semester: 2006/2007

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| Course Title: Neural-Networks & Fuzzy logic | Date: 10/6/2007 |
| Course No: (630551) | Time Allowed: 2 Hours |
| Lecturer: Dr. Mohammed Mahdi | No. of Pages: 2 |

Question 1: (10 Marks)

Objectives:

This question is about the concept of Neural Networks.

- A) What does each of the following terms mean? (4 Marks)
- * Axon.
 - * Perceptron.
 - * Discriminatory Layer.
 - * Grossberg Classifier.
- B) Show with equations the backward phase of EBP learning algorithm. (3 Marks)
- C) What kind of performance index used in: - (3 Marks)
- * MLP NN.
 - * Kohonen NN.
 - * Hopfield NN.

Question 2: (15 Marks)

Objectives:

This question is about the MLP, SOFM, and Hopfield NN's.

- A) Where does fault tolerance feature exist? (3 Marks)
- B) Given the vectors x, y, z where; (3 Marks)
- $$x = [0.2 \ -1.4 \ 2.3], y = [0.6 \ -4.0 \ 7.0], z = [0.1 \ -1.0 \ 2.2]$$

Which vector (y or z) is x nearest to in terms of Euclidean distance?

- C) Write down the SOFM weight updating equation. Which parameter is the most important? (3 Marks)
- D) Find the weights matrix of a Hopfield NN to store the pattern $[1 \ -1 \ 1 \ 1]$. (3 Marks)
- E) Sketch a suitable MLP NN topology to learn a matrix of 4×4 . (3 Marks)

Question 3: (10 Marks)

Objectives:

This question is about the basic concepts of Fuzzy logic and Neurofuzzy systems.

- A) Answer the following briefly: - (5 Marks)
- * Is it worthy to use a neurofuzzy fuzzifier element? Why?
 - * What are the main differences between structural & functional neurofuzzy control systems?
- B) Given the following fuzzy controller applications. It is required to extract two indicative FPR's for each application: - (5 Marks)
- * Washing machine.
 - * Elevator.

Question 4:

(15 Marks)

Objectives:

This question is about the design of neurofuzzy system.

Given the following system specifications: -

- * Error signal of range from -1.0 to + 3.0 with 5-equally spaced quantized levels.**
- * Change of error signal of range from -0.1 to + 0.3 with 5-equally spaced quantized levels.**
- * Control action signal of range from -2.0 to + 2.0 with 5-equally spaced quantized levels.**

It is required to: -

- 1- Assign three fuzzy sets for each one of the above variable, show with graph. (5 Marks)**
- 2- Derive the FPR's table. (5 Marks)**
- 3- Sketch the overall structural neurofuzzy MLP topology based on your design. (5 Marks)**