

Philadelphia University



Student Name:

Faculty of Engineering

Student Number:

Dept. of Computer Engineering  
Final Exam, Second Semester: 2008/2009

Course Title: Neural Networks & Fuzzy Logic	Date: 8/6/2009
Course No: (630551)	Time Allowed: 2 Hours
Lecturer: Dr. Mohammed Mahdi	No. Of Pages: 2

**Question 1:**

*(15 Marks)*

**Objectives:**

This question is about the general concepts of NNs and Fuzzy logic.

Explain the following briefly: -

1. Artificial Neural Networks ( ANN's) are considered as a computing system.
2. Error-back propagation learning algorithm had taken more than 10 years to find its solution.
3. The fast development of computers made ANN's to be used in a wide range.
4. ANN's learning can be classified as supervised and unsupervised.
5. In Multi-layer perceptron (MLP) NN the steepness value never be zero.
6. Hidden layer in MLP NN can be named by discriminatory layer.
7. Radius value in Kohonen NN can take any small value even zero.
8. It is needless to convert the fuzzifier element into NN.
9. Learning of the Fuzzy Production Rules (FPRs) as a binary level (exist and non-exist) using NN will give many advantages.
10. Scaling factors are used to map the input-output crisp values in the fuzzy logic system.

**Question 2:**

*(10 Marks)*

**Objectives:**

This question is about the implementation of MLP NN.

- A) If there will be some complexity in learning of MLP NN, what are the steps used to get rid of this problem? (5 Marks)
- B) Suggest and sketch the most suitable MLP NN topology for each of the following cases giving your reasons. (5 Marks)
  1. 2-input XOR logic case.
  2. Colored image of 20x15 dimensions.

**Question 3:**

**(10 Marks)**

**Objectives:**

**This question is about the activation function and Kohonen NN.**

- A) Given the following activation function  $y = \frac{e^u - e^{-u}}{e^u + e^{-u}}$ . it is required to: -**  
(5 Marks)
- 1. Name it.**
  - 2. Derive and sketch it.**
  - 3. If it is used with MLP NN, do you expect good result? Why?**
- B) Do you explain why the Kohonen NN learning algorithm is called winner-take-all criterion? What is the important parameter in its learning algorithm?**  
(5 Marks)

**Question 4:**

**(15 Marks)**

**Objectives:**

**This question is about the design of the Fuzzy Logic control system.**

- A) Design a full FLC system with the following specifications: -**
- 1. Three fuzzy sets named N, Z, P for Negative, Zero, and Positive respectively and they are common for all variables.**
  - 2. Triangular fuzzifier with distribution parameter value = 5.**
  - 3. Unified 11- quantized level Universe of Discourse with limits -10 and +10.**
  - 4. Center of gravity defuzzifier.**
  - 5. Suitable input-output scale factors.**

**It is required to apply the above design to find the crisp control action (u) for the input crisp values ( $s_1=0.6, s_2= - 0.4$ ). Knowing that  $s_{1max} = s_{2max} = 1.0$**  (12 Marks)

- B) If the fuzzy sets for input-output variables in a certain FLCs are NB, NS, Z, PS, PB which they stand for Negative Big, Negative Small, Zero, Positive Small, and Positive Big respectively, show the expected FPRs table.** (3 Marks)