Dept. of Computer Engineering

Final Exam, First Semester: 2013/2014

Course Title: Intelligent System Design + Machine Intelligence	**Date:** 4/2/2014
Course No: (630423+640424)	**Time Allowed: 2 Hours**
Lecturer: Dr. Mohammed Mahdi	**No. of Pages: 2**

Question 1:   *(15 Marks)*

Objectives: This question is about the basic concepts of Artificial Intelligence systems design.

Answer the following **briefly**: -

1. **The domain expert is the main member of expert system development team.**

2. **Show the differences between forward and backward chaining inference techniques.**

3. **It is needless to convert Fuzzifier element into MLP NN form.**

4. **State the steps that can be taken to enhance MLP NN learning.**

5. **For the Elevator application try to extract three FPR's.**

6. **There are two kinds of Neuro-Fuzzy systems.**

Question 2:   *(10 Marks)*

Objectives: This question is about Fixed FLC design and MLP NN.

A) Given the following system specifications: -

- **Bi-directional D.C motor voltage ranges - 5 → + 5 volt.**

- **Five fuzzy sets definition of NB, NS, Z, PS, and PB for all variables.**

- **11- Quantized levels unified universe of discourse from - 1 to +1.**

It is required to: -

- **Show the related design of random fuzzifier.**

- **Show the FPR's Matrix.**

- **Apply Mamdani FLC algorithm for Input states Error =1.0, and CE=0.0**

(7 Marks)

B) Suggest a suitable MLP NN topology and parameter settings to train a gray level image of 20x5. (3 Marks)

Question 3: (10 Marks)

Objectives: This question is about SOFM NN.

A) State the main properties of SOFM NN. Then show its algorithmic learning steps.
(5 Marks)

B) An SOFM NN with two input units and two clusters units is to be trained using the

following two vectors: - V1 = [0.5 0.8], V2 = [0.6 0.9], with initial weights of $\begin{bmatrix} 0.1 & 0.2 \\ 0.7 & 0.4 \end{bmatrix}$ the

initial radius is 0 and the learning rate is 0.25. Calculate the weight changes during the first
cycle through the data, taking the training vectors as in the given order. (5 Marks)

Question 4: (5 Marks)

Objectives: This question is about NN's activation function.

Given the function: -

$$y(x) = -1 + \frac{2}{(1 + e^{-x})}$$

It is required to: -

- Sketch and extract its characteristics.
- Name it.
- Can you use it in MLP NN? Why?