Philadelphia University   **Student Name:**

Faculty of Engineering   **Student Number:**

Dept. of Computer Engineering
Final Exam, Second Semester: 2013/2014

Course Title: Artificial Intelligence System Design & Machine Intelligence	**Date:** 12/6/2014
Course No: (640424+630423)	Time Allowed: 2 Hours
Lecturer: Dr. Mohammed Mahdi	No. of Pages: 2

Question 1:   *(10 Marks)*
Objectives: This question is about the basic concepts of Expert Systems.

1. Sketch the schematic diagram of the expert system development team showing the relation

   between each member.   (5 Marks)

2. Table below shows the main features of the forward and backward rules chaining techniques. It

   is required to put your explanation for each one.   (5 Marks)

Attribute	Backward Chaining	Forward Chaining	Explanation
Also known as	Goal-driven	Data-driven	
Processing	Efficient	Somewhat wasteful	
Flow	Action to situation	Situation to action	

Question 2:   **(10 Marks)**
Objectives: This question is about Fuzzy Logic.

1. State the main advantages of using Fuzzy logic in engineering.   (5 Marks)

2. Use fuzzy basic operations to prove the relation $\overline{A \cup B} = \bar{A} \cap \bar{B}$ for the following fuzzy sets

   definitions: -   (5 Marks)

$$A= \{1, 0.5, 0.6, 0.2, 0.6\} \text{ and } B= \{0.5, 0.8, 0.4, 0.7, 0.3\}$$

Question 3:   **(10 Marks)**
Objectives: This question is about NN.

1. State the main steps one may use to improve leaning in MLP NN.   (5 Marks)
2. For the figure shown below, it is required to answer the following: -   (5 Marks)
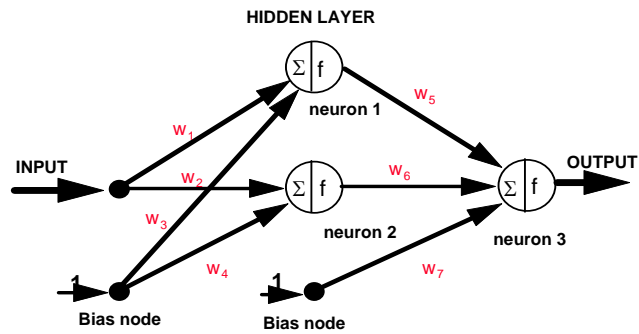
- Name the layers with two other names for each.
- What are the possible activation functions one may use?
- What are the limitations of its topology and learning?
- Explain the equation that is used to update its weights.
- What is the used activation function if its derivative is as in figure below?
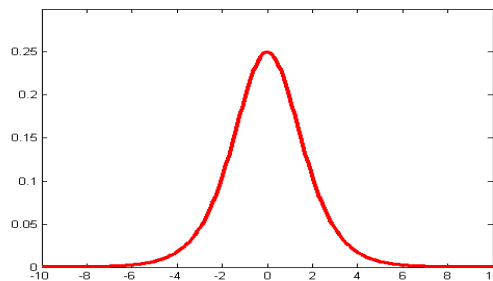
Question 4: (10 Marks)

Objectives: This question is about Neurofuuzy System and the design of FLC.

1. Explain the main reason for using Neurofuzzy system. (2 marks)

2. Explain the available architectures of Neurofuzzy system. (2 marks)

3. Design a Fuzzy Logic Controller with the following specifications: - (6 marks)

   - Three fuzzy set definition (NS, Z, and PS) for input-output variables.

   - Unified UOD of 11-quantized levels between -1 and +1.

   – Random fuzzifier design with center of gravity defuzzifier.

Then apply Mamdani control algorithm for input states of error = + 0.2, and change of error = - 0.2. What conclusion can you make?