

**COLLEGE OF COMPUTER & INFORMATION SCIENCES  
COMPUTER ENGINEERING DEPARTMENT  
First Semester 1428-1429 H.**

**CEN 457: Intelligent systems and its application in computer engineering  
Instructor: Dr R. HEDJAR**

## **HW#9**

### **Questions:**

**1. Exercises 4.1 and 4.2, from the text Book.**

**2. Problem:**

Investigate the use of back-propagation learning using a sigmoid nonlinearity to achieve one-to-one mappings as described here:

- a.  $f(x) = \frac{1}{x}$  for  $1 \leq x \leq 100$ ,
- b.  $f(x) = \log_{10} x$  for  $1 \leq x \leq 10$ ,
- c.  $f(x) = \exp(-x)$  for  $1 \leq x \leq 10$ ,
- d.  $f(x) = \sin(x)$  for  $0 \leq x \leq \frac{\pi}{2}$ .

For each mapping, do the following:

- a. Set up two sets of data with different step (0.1 for training and 0.01 for testing) .
- b. Use the training data set to compute the synaptic weight of the network, assumed to have a single hidden layer.
  - Write MATLAB code to train the network.
  - Write NN Toolbox code to train the network.
- c. Evaluate the computation accuracy of the network by using the test data.
- d. Does your network do the generalization?
- e. Use a single hidden layer but with a variable number of hidden neurons. Investigate how the network performance is affected by varying the size of the hidden layer.