DEPARTMENT OF COMPUTER ENGINEERING
FACULTY OF ENGINEERING, UNIVERSITY OF BENIN, BENIN CITY, NIGERIA
FIRST SEMESTER EXAMINATION
SESSION: 2018/2019 SESSION, DATE: 16ᵗʰ July, 2019
CPE573: ARTIFICIAL NEURAL NETWORK   TIME: 3HRS
INSTRUCTION: Answer four (4) questions only.

EDOHWIOMHU ETIFIAMUEL OSIWUCHE   PH09140344b (handwritten)

1. (a) What is Artificial Neural Network?   (3marks)
    (b) Describe and sketch the graph of the following activation functions
        (i) Threshold function   (3marks)
        (ii) Sigmoid function   (3marks)
    (c) With a diagram, explain single and multilayer feed-forward neural network   (8marks)
    (d) Explain the following terms; supervised learning and unsupervised learning. State two
    learning laws that are supervised and unsupervised.   (8marks)

2. (a) What are the main differences among the three models of artificial neuron, namely, Adaline,
    Rosenblatt's perceptron and McCulluch-Pitts?   (6marks)
    (b) What is the function of learning rate in neural network?   (2marks)
    (c) With an example, discuss how training set and test-set are used for classification. (5marks)
    (d) With the aid of a diagram, discuss the similarity of artificial neural network with human
    brain.   (4marks)
    (e) State two (2) advantages and disadvantages of artificial neural network.   (4marks)
    (f) Distinguish between pattern association and pattern recognition   (4marks)

3. Compute only the first forward and backward propagation of Figure 4.0 below. Target output is 1
    (one), learning rate is 0.25, and use the binary sigmoidal activation function.   (25marks)
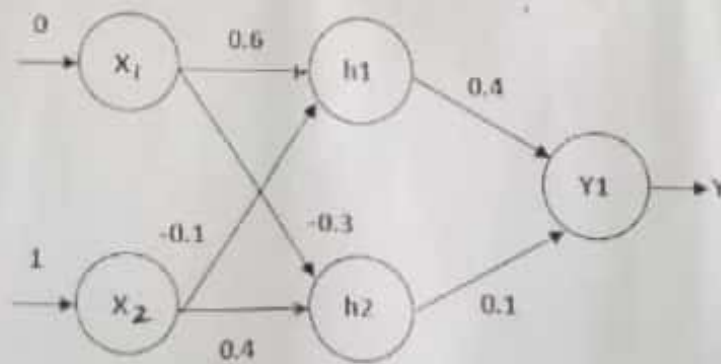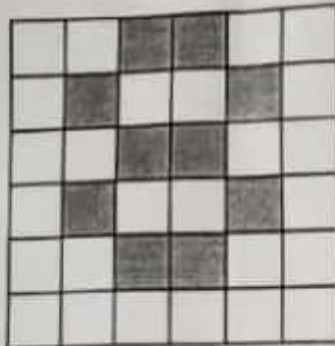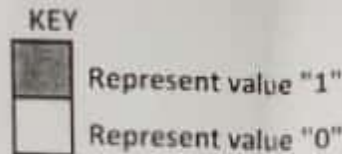

Figure 3.0

4. Artificial Neural Network (ANN) are implemented on computers. List six performance
    comparison of computer and biological neural network and discuss each of them.   (25marks)

5. (a) With an example, discuss how to make the output matrix same size as the input matrix after
    computation of the convolutional operation stage in the Convolutional neural network (CNN).
                                                                                          (5marks)
    (b) Figure 5.0(a) is an image, each square box represents a pixel and the white pixel is a value "0"
    and dark pixel is a value "1". Show the binary image of Figure 5.0(a). Use this result to compute
    the input values to the fully-connected part of the CNN, given; Padding = Valid, Stride = 1,

Activation function = ReLU, Pooling = Average, and kernel = Figure 5(b). Show the diagram for the fully-connected part of the CNN with the input result obtained, one (1) hidden layer of four (4) neurons and two (2) output. **(20marks)**

procing average

KEY

Represent value "1"

Represent value "0"

0	0	1
0	1	0
-1	0	0

(a) Image

(b) Kernel

Figure 5.0

6. Construct and show the final architecture of a Self-Organizing Map (SOM) with two (2) cluster, that will cluster four (4) given vectors [0 0 1 1], [1 0 0 0], [0 1 1 0] and [0 0 0 1], given the initial weight to cluster one (1) as [0.2, 0.4, 0.6, 0.8] and cluster two (2) as [0.9, 0.7, 0.5, 0.3]. Assume an initial learning rate of 0.5. **(25marks)**