MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2017/2018 CADEMIC YEAR

SCHOOL OF SCIENCE AND INFORMATION SCIENCES

DEPARTMENT OF COMPUTING AND INFORMATION SCIENCES

FOURTH YEAR SECOND SEMESTER EXAMINATION

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: COM 424E

COURSE TITLE: NEURAL NETWORKS

DATE: 24TH APRIL 2018 TIME:11:00AM-1:00PM

INSTRUCTIONS TO CANDIDATES:

ANSWER ALL QUESTIONS IN SECTION A AND ANY 2 QUESTIONS IN SECTION B

This paper consists of 3 printed pages. Please turn over

SECTION A (COMPULSORY – 30 MARKS)

SECTION A: COMPULSORY

1.

a) Define the term

i. Neural Networks [2 Marks]

ii. Propagation function and network input [4 Marks]

iii. Feedforward network:

iv. Recurrent networks [2 Marks]

b)

i. Distinguish between directed and indirect recurrence [4 marks]

ii. Explain at least two applications of technical neural networks: [4 marks]

iii. Discuss Components of neural networks [4 marks]

c) Define the following terms

i. Synchronous activation [2 Marks]

ii. Random permutation [2 Marks]

iii. Topological activation [2 Marks]

iv. Explain two neural network learning paradigms [4 marks]

SECTION B

2.

i. Distinguish between Online and Offline learning [4 marks]

ii. Explain the Hebbian rule [2 marks]

iii. Calculate the average value μ and the standard deviation _ for the following data points. [6 marks]

$p1 = (2, 2, 2)$
$p2 = (3, 3, 3)$
$p3 = (4, 4, 4)$
$p4 = (6, 0, 0)$
$p5 = (0, 6, 0)$
$p6 = (0, 0, 6)$

iv. Define the following terms

a) Input neuron [2 marks]

b) Information processing neuron [2 marks]

c) Perceptron [2 marks]

d) Single layer perceptron [2 marks]

3.

i. Provide the Perceptron learning algorithm. [10 marks]

ii. Explain the following terms in reference to NN in relation to human nervous system

a. Receptors [2 Marks]

b. Effectors [2 Marks]

c. neural net (brain) [2 Marks]

4.

i. Explain the Hopfield network**.** [2 marks]

ii. Explain the Learning rule for Hopfield networks**.** [4 Marks]

iii. Distinguish between heteroassociator and an autoassociator [4 marks]

iv. Hopfield network with $|K| = 1000$ neurons when the weights $w_{i,j}$ shall be stored as integers. Is it possible to limit the value range of the weights in order to save storage space? [10 marks]

5.

i. Compute the weights $w_{i,j}$ for a Hopfield network using the training set

$$P = \{(-1,-1,-1,-1,-1, 1);$$
$$(-1, 1, 1,-1,-1,-1);$$
$$(1,-1,-1, 1,-1, 1)\}.$$

[13 marks]

ii. Write down the equation for the output Yj of a McCulloch-Pitts neuron as a function of its inputs Ii. [4 Marks]

iii. State the Learning rule [3 Marks]

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