



Kasarani Campus
Off Thika Road
P. O. Box 49274, 00101
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
FOURTH YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

KCS 2412: NEURAL NETWORK

DATE: 6TH DECEMBER, 2024
TIME: 2:30PM-4:30PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE: COMPULSORY (30 MARKS)

- a) With the help of a diagram explain what an Artificial Neural Network is **(3 Marks)**
- b) Outline **FOUR** application areas of artificial neural network. **(4 Marks)**
- c) Distinguish between Learning and Training in neural network. **(2 Marks)**
- d) Draw the model of a single artificial neuron and derive its output. **(4 Marks)**
- e) Explain the differences between Single Layer Perceptron (SLP) and Multilayer Perceptron (MLP). **(3 Marks)**
- f) Explain the following terms with regard to the gradient descent algorithm:
 - i. Local minimum **(2 Marks)**
 - ii. Global minimum **(2 Marks)**
- g) Explain the stochastic optimization methods for weight determination when training a neural Network. **(3 Marks)**
- h) Explain the following activation functions as it pertains to machine learning:
 - i. Sigmoid Squashing Function **(4 Marks)**
 - ii. Extensions to sigmoid **(3 Marks)**

QUESTION TWO: (20 MARKS)

- a) Using the McCulloch and Pitts Neural Networks, develop simple ANNs to implement the three input AND, OR and XOR functions **(10 Marks)**
- b) With the help of a diagram, explain the operation of a single layer perceptron (SLP), consequently mention its advantages and disadvantages **(8 Marks)**

c) Explain the Least Mean Square (LMS) algorithm as used in neural networks. **(2 Marks)**

QUESTION THREE: (20 MARKS)

a) Learning mechanisms are the changes in parameters of a Neural Network with response to a new environment. Explain the following models of learning mechanisms;

i. Error based learning **(5 Marks)**

ii. Memory based learning **(5 Marks)**

b) Distinguish between supervised and unsupervised learning as applied to Neural Nets. **(10 Marks)**

QUESTION FOUR: (20 MARKS)

a) When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in the firing, some growth process or metabolic change takes place in one or both the cells such that A's efficiency as one of the cells firing B, is increased. Explain this Model with its various assumptions. **(10 Marks)**

b) Briefly describe the following neural networks libraries and APIs and their applications

i. Keras **(3 Marks)**

ii. Tensorflow **(4 Marks)**

iii. Pytorch **(3 Marks)**

QUESTION FIVE: (20 MARKS)

a) You have been hired by Nairobi Hospital as bioinformatics expert, whereby you will be using artificial neural network algorithm for early predictions of chronic medical conditions. You have been provided with lung cancer dataset (.csv). In this project you will be using jupyter notebook and Keras artificial neural network framework

Task

Write the codes that will perform the following

i. Load all the necessary libraries to notebook **(2 Marks)**

ii. Load the dataset to notebook **(2 Marks)**

iii. Identifying the missing values within the data **(2 Marks)**

iv. Filling missing values using mean/average **(2 Marks)**

v. Perform training and testing and displaying evaluation metrics **(2 Marks)**

b) Describe five preprocessing activities need to be done to improve the quality of the text data

(10 Marks)