



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
ELECTRICAL AND ELECTRONICS ENGINEERING
UNIVERSITY EXAMINATION FOR:
DEGREE
TEE 4422: NEURAL NETWORKS AND FUZZY LOGIC
END OF SEMESTER EXAMINATION

SERIES: MAY 2025

TIME: 2 HOURS

DATE: May 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt Question 1, Compulsory and any other Two Questions.

Do not write on the question paper.

QUESTION ONE

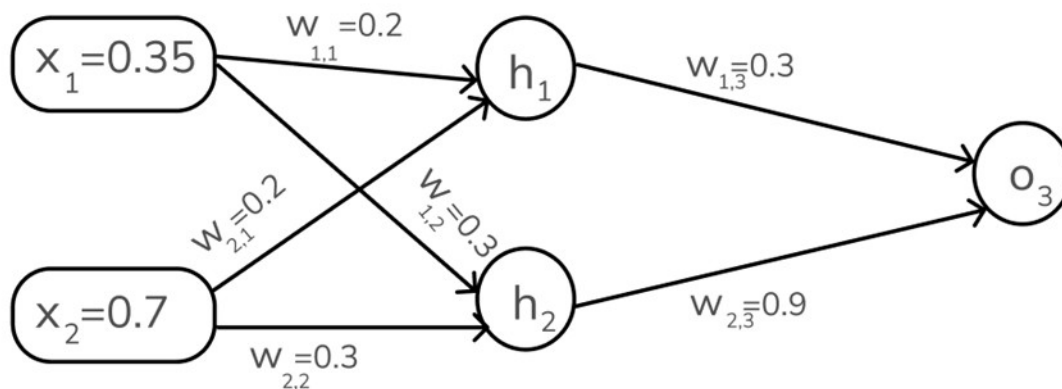
- a) With aid of diagram illustrate the different layers of convolution neural network [CNN]
[6 MARKS]
- b) Design a fuzzy controller for a train approaching the station. inputs are speed and distance and output is breaking power. Using triangular member function. consider two descriptors for input and three descriptors for output. Deduce a set of rules for control action and defuzzification's design should be supported by figures whenever possible. Design a fuzzy controller for a train with high speeds and small distances [10 MARKS]
- c) B=Briefly explain the basic building blocks of artificial neural networks [4 MARKS]

- d) **Highlight TWO** advantages of ANN [2 MARKS]
- e) Explain the difference between bias and variance as used in ANN [2 MARKS]
- f) Using a neat sketch explain the working of a fuzzy controller [4 MARKS]
- g) **differentiate** between binary and bipolar sigmoidal function [2 MARKS]

QUESTION TWO

- a) Assume that the neurons have the sigmoid activation function to perform forward and backward pass on the network. And also assume that the actual output of y is 0.5 and the learning rate is 1. Now perform the backpropagation using backpropagation algorithm.

[10 MARKS]



- b) What is backpropagation? [2 MARKS]
- c) Explain the advantages of Using the Backpropagation Algorithm in Neural Networks

[4 MARKS]

- d) Briefly explain the working principal of Backpropagation Algorithm

[4

MARKS]

- e) Highlight and explain an example of Backpropagation in Machine Learning

[2

MARKS]

QUESTION THREE

- a) Describe the different types of layers commonly used in artificial neural networks. Provide examples of tasks or scenarios where each type of layer is typically used. **[4 MARKS]**
- b) Discuss the advantages and disadvantages of convolutional neural networks (CNNs) compared to fully connected (dense) neural networks. In what types of tasks are CNNs particularly effective? **[4 MARKS]**
- c) Compare and contrast supervised and unsupervised learning in the context of artificial neural networks. Provide examples of tasks suitable for each type of learning. **[4 MARKS]**
- d) Explain the concept of activation functions in artificial neural networks. Provide examples of commonly used activation functions and discuss their properties. **[4 MARKS]**
- e) Discuss the concept of overfitting in the context of artificial neural networks. What are some techniques to prevent or mitigate overfitting during the training process? **[4 MARKS]**

QUESTION FOUR

- a) Explain how neural network are modelled **[4 MARKS]**
- b) Explain how neural networks can be unsupervised **[2 MARKS]**
- c) Explain how neural networks get optimal weight and bias value **[2 MARKS]**
- d) What is the difference between forward propagation and backward propagation **[2 MARKS]**
- e) Explain the working principal of perceptron **[2 MARKS]**
- f) Explain why the initialization process of weights and bias is important in artificial neural network **[4 MARKS]**
- g) briefly elaborate the preventive measures of overfitting when designing an artificial neural network **[2 MARKS]**

QUESTION FIVE

- a) Highlight the different types of perceptrons? **[2 MARKS]**
- b) Explain the the role of activation functions in neural networks **[2 MARKS]**
- c) Deduce how learning rate affect the training of a neural network **[4 MARKS]**

- d) Briefly explain the advantages of using neural networks over other machine learning algorithms

[4

MARKS]

- e) ANN is a computing system made of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs. Discuss the basic structure and working of ANN

[8 MARKS]