UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

DICT0214

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

END TERM EXAMINATION

DATE: TUESDAY 9TH DECEMBER, 2025 TIME:2:00PM-4:00PM

DURATION: 2 HOURS

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 Marks) Compulsory

a)

i. Identify the biological concept that inspired the development of deep learning in artificial intelligence. **(1 mark**)

ii. Describe the approaches of the three major schools of thought in Artificial Intelligence. **(3 marks)**

b) Explain three key data preprocessing tasks that enhance the quality, consistency, and usability of data before analysis. **(3 marks)**

c) Discuss the importance of AI ethics highlighting two major ethical challenges associated with the development and deployment of artificial intelligence systems. **(3 marks)**

d) Explain Howard Gardner's Theory of Multiple Intelligences by listing and briefly describing five types of intelligence proposed in the theory. **(5 marks)**

SECTION B: (ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

QUESTION TWO (15 marks)

The table below shows data collected from recently sold houses in Roysambu area of Nairobi County, showing the number of rooms and their corresponding selling prices (KES).

Number of Rooms	Price (KES)
2	2,100,000
4	4,800,000
1	1,600,000
3	3,900,000
3	3,500,000
7	8,800,000
4	4,200,000
2	2,700,000
2	2,900,000
3	3,200,000
3	3,700,000
5	6,000,000

You are required to develop a simple linear regression model to predict the price of a newly constructed 3.5-room house in Roysambu.

Tasks;

a) Define the concept of linear regression and explain its purpose and application in predicting housing prices. **(3 marks)**
b) Identify the dependent and independent variables in the provided housing dataset, justifying your choices. **(2 marks)**
c) Develop a Python program using the scikit-learn library to train a linear regression model on the given data and predict the price of a 3.5-room house. **(5 marks)**
d) Visualize the regression results by plotting the regression line along with the actual data points using Matplotlib, ensuring all axes are clearly labeled. **(3 marks)**
e) Interpret the output of the regression model and explain what the regression line reveals about the relationship between the number of rooms and house prices in Roysambu. **(2 marks)**

QUESTION THREE (15 marks)

You are developing a machine learning model to predict whether a student will pass (1) or fail (0) based on their study hours.
The dataset is as follows:

Study Hours (x)	Pass (y)
1	0
2	0
3	0
4	1
5	1
6	1

The logistic regression model is defined as:

$$P(y = 1|x) = \frac{1}{1 + e^{-(w_0 + w_1 x)}}$$

A student is classified as Pass (1) if the predicted probability is greater than 0.5.

a) Define logistic regression and explain how it differs from linear regression in terms of output and use case. (3 marks)
b) Write a Python program using the scikit-learn library to train a logistic regression model with the given dataset and predict the probability that a student who studies 3.5 hours will pass. (5 marks)
c) Calculate and interpret the model's predicted probability and classification for the student studying 3.5 hours, given that the output is:
Predicted probability of passing: 0.62
Predicted class: [1]
What does this indicate about the student's likelihood of passing? (3 marks)
d) Discuss two advantages and one limitation of using logistic regression for predicting student outcomes. (4 marks)

QUESTION FOUR (15 marks)

a) Define clustering and explain its role in unsupervised learning. **(3 marks)**

b) Explain the main steps of the K-Means clustering algorithm, including how centroids are initialized and updated. **(4 marks)**

c) i) Write a short Python program (using scikit-learn) to perform K-Means clustering on the dataset provided below and display the resulting clusters on a scatter plot. **(4 marks)**

```
data = {'X': [1, 2, 3, 8, 9, 10],
        'Y': [1, 2, 3, 8, 9, 10]}
```

ii) What does the formation of two distinct clusters suggest about the relationship between X and Y values? **(2 marks)**

d) Discuss two real-world applications of clustering in data-driven decision-making. **(2 marks)**

QUESTION FIVE (15 marks)

Deep learning has revolutionized various industries through computer vision applications that enable machines to perceive and interpret visual data like humans.

a) Define computer vision and explain how it relates to deep learning. **(3 marks)**
b) Discuss any three real-world applications of computer vision, explaining the role of deep learning in each scenario. **(6 marks)**
c) Describe how deep learning contributes to medical imaging and autonomous driving innovations**. (4 marks)**
d) Explain two major ethical or societal considerations that may arise from the use of deep learning in facial recognition systems**. (2 marks)**

QUESTION SIX (15 marks)

Discuss the key stages of the machine learning workflow highlighting how each stage contributes to building a functional and reliable machine learning model**. (15 marks)**