Quiz 04: Multiple Linear Regression Analysis

Course Code: CS3151

Topic: Linear Regression with Two Independent Variables

CLO: CLO3 – Analyze artificial intelligence techniques for practical problem-solving

Total Marks: 20

Submission Deadline: 28-06-2025

# Background:

Linear regression is used to model the relationship between one dependent variable and one or more independent variables. In this assignment, you will perform regression analysis using a small dataset with two independent variables.

# Dataset:

|  |  |  |  |
| --- | --- | --- | --- |
| Student | Study Hours (X₁) | Sleep Hours (X₂) | Exam Score (Y) |
| A | 2 | 6 | 55 |
| B | 3 | 5 | 60 |
| C | 4 | 6 | 65 |
| D | 5 | 4 | 70 |
| E | 6 | 5 | 75 |

Where:  
- X₁ = Study Hours (independent variable 1)  
- X₂ = Sleep Hours (independent variable 2)  
- Y = Exam Score (dependent variable)

# Instructions and Questions:

## Q1. Understanding the Model (3 marks)

* a. Write the general form of the multiple linear regression equation with two variables.
* b. Define each term in the equation.

## Q2. Manual Computation (6 marks)

* a. Compute the coefficients (β₀, β₁, β₂) using the normal equation method (optional: use matrix operations or software like Excel/Python).
* b. Write the resulting regression equation.

## Q3. Interpretation (5 marks)

* a. Interpret the meaning of each coefficient in the context of this dataset.
* b. Predict the exam score for a student who studies 5 hours and sleeps 6 hours using your regression model.

## Q4. Model Evaluation (3 marks)

* a. Calculate the predicted values and residuals for each student.
* b. Compute the Mean Squared Error (MSE) of the model.