

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 (X_1)	Sleep Hours (X_2)	Exam Score (Y)
A	2	6	55
B	3	5	60
C	4	6	65
D	5	4	70
E	6	5	75

Where:

- X_1 = Study Hours (independent variable 1)
- X_2 = 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 ($\beta_0, \beta_1, \beta_2$) 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.