Nirma University
Institute of Technology
Sessional Examination, February 2026
M. Tech. in CSE/CSE (Data Science), Semester - II
6CS376ME25 – EXPLAINABLE AI

Roll / Exam No.	25MCD005	Supervisor's initial with date	Quolu

Time: 2 Hours   Max. Marks: 50

Instructions: 1. Attempt all questions.
                  2. Assume necessary data wherever required and specify them.
                  3. Avoid attempting questions and their sub-questions in a random order.

Q.1   Answer following questions: **[13]**
(A)   In context to explainable AI models, describe transparency,   [8]
CO1,   interpretability, fairness and explainability. Consider an AI model
BL2   used for loan approval provides full access to its internal parameters
          and structure to the development team. When a customer's loan
          application is rejected, the customer is unable to understand the
          reason for the decision. Using the concepts of transparency,
          interpretability, and explainability, analyze what is lacking in this
          system. Also explain why making the model fully visible does not
          necessarily achieve interpretability and explainability?

(B)   Explain the mathematical role of the link function in GLMs and GAMs,   [5]
CO1,   and discuss what difference the link function brings to the model.
BL2

Q.2   Answer following questions: **[10]**
(A)   Decision Trees are often described as intrinsically explainable models.   [5]
CO3,   Critically analyze this statement by explaining what properties of
BL4   Decision Trees make them inherently interpretable. Also discuss one
          practical situation where a Decision Tree might still become difficult
          to interpret despite being intrinsically explainable.

(B)   An insurance company's predictive model rejects a specific customer's   [5]
CO4,   claim, and the customer requests an explanation for the decision.
BL5   From an explainable AI perspective, should the company prefer a local
          explanation or a global explanation in this situation? Justify your
          choice with reasoning, and also discuss potential risk(s) of relying only
          on the chosen type of explanation.

Q.3   Consider the following linear regression model used for loan risk   **[15]**
CO2,   prediction:
BL3 $f(x_1, x_2) = 3x_1 + 2x_2 + 5$

You are given the following dataset:

x_1	x_2
2	1
4	3
6	2

- Write the standard mathematical formula used to compute the SHAP value for a feature i. Clearly explain the meaning and role of each component in the equation.
- Compute the expected value (baseline) of the model output.
- Using the standard Shapley formula, calculate the SHAP values for x_1 and x_2 for the second record (4, 3).
- Verify that the SHAP values satisfy the additivity property.
- Briefly interpret the contribution of each feature.

Q.4
CO2,
BL3

Consider the following regression model used for house price **[12]** prediction: $f(x, y) = 2x + 3y + 10$.
Where, x = House Size in 1000 sq ft and y = Number of Rooms.
You are given the following dataset:

x	y
1.5	2
2.0	3
2.5	4
3.0	5

i.   Compute the Partial Dependence (PD) values for feature x at x = 2.0.

ii. Show all intermediate model predictions used in PDP computation.

iii. Compute the average prediction to obtain the PDP value(s).

iv. Briefly interpret what the PDP value represents for feature x.