QP Code: RA23BTECH175 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BCDPE36011 – Machine Learning
(CSE-DS)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the concept of Machine Learning. Provide a formal definition and discuss how Machine Learning differs from traditional programming approaches.	CO1	K1
b. State the difference between L1 and L2 regularization.	CO3	K2
c. A dataset has 10 positive and 5 negative samples. Compute the entropy of the datase	CO2	K3
d. Explain Principal Component Analysis (PCA) and discuss how it is used for dimensionality reduction.	CO6	K1
e. Define a perceptron and explain its role as the basic building block of neural networks.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the various types of machine learning models, providing appropriate examples for each.	5	CO1	K1
b. Compare the training and testing processes, illustrating your explanation with learning curves.	5	CO1	K1
(OR)			
c. Explain components of a learning system with diagram.	5	CO1	K1
d. Explain learning curves and their significance.	5	CO1	K1
3.a. Given data points: X = [1, 2, 3], Y = [1, 4, 9]. Fit a second-degree polynomial regression model. Find coefficients and predict Y when X = 4.	5	CO2	K3
b. Explain gradient descent algorithm for linear regression.	5	CO2	K2
(OR)			
c. Derive simple linear regression equation.	5	CO2	K3

X	1	2	3	4	5
Y	2	2.5	3.8	3.5	5.2

d. Explain Multiple vs multivariate regression.	5	CO2	K2
4.a. Use Naïve Bayes Classifier to predict whether the person will Play_Tennis when: Weather = Sunny**,** Temperature = Mild	5	CO4	K2

Weather	**Temperature**	**Play_Tennis**
Sunny	Hot	No
Overcast	Hot	Yes
Rain	Mild	Yes
Sunny	Mild	Yes
Sunny	Cool	No

b.	Explain the confusion matrix and describe the various performance metrics derived from it, such as accuracy, precision, recall, and F1-score.	5	CO3	K2
	(OR)			
c.	<table><tr><th>Outlook</th><th>Play_Tennis</th></tr><tr><td>Sunny</td><td>No</td></tr><tr><td>Sunny</td><td>Yes</td></tr><tr><td>Overcast</td><td>Yes</td></tr><tr><td>Rain</td><td>Yes</td></tr><tr><td>Rain</td><td>No</td></tr></table> Using ID3 Algorithm, calculate the Information Gain for the attribute Outlook concerning the target Play_Tennis. Which attribute would be selected as the root node? Explain briefly about it	5	CO3	K3
d.	Explain the K-Nearest Neighbors (KNN) algorithm in detail and illustrate its working with a suitable example.	5	CO4	K2
5.a.	Given two support vectors: Class +1: (3, 3), Class –1: (1, 1) • Find the equation of the separating hyperplane. • Calculate the ***margin***. • Identify the support vectors.	5	CO5	K3
b.	Explain the architecture of a Multi-Layer Perceptron (MLP) and describe the role of input, hidden, and output layers.	5	CO5	K2
	(OR)			
c.	x_1 x_2 y 0 0 0 0 1 0 1 0 0 1 1 1 Initial weights $w_1 = 0$, $w_2 = 0$, bias = 0, learning rate = 1 • Perform one epoch of perceptron learning • Update weights step-by-step.	5	CO5	K3
d.	Describe ensemble Learning.	5	CO5	K2
6.a.	Provide an overview of Convolutional Neural Networks (CNN) and explain their architectures and use cases.	5	CO6	K2
b.	Explain the concept of hierarchical clustering and describe its types and working procedure.	5	CO6	K3
	(OR)			
c.	Derive and explain Principal Component Analysis (PCA) and describe how it is used for dimensionality reduction.	5	CO6	K2
d.	Given the following 2D dataset:(2,10), (2,5), (8,4),(5,8), (7,5) (6,4) with two initial centroids C1 = (2,10), C2 = (8,4). Apply K-Mean clustering to group the data.	5	CO6	K3

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