

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-3 EXAMINATION – 2026
B.Tech-IV Semester (ECE)

COURSE CODE (CREDITS): 25B1WEC431 (3)

MAX. MARKS: 35

COURSENAME: Foundation of Machine Learning and Python

COURSE INSTRUCTORS: Dr. Vikas Baghel

MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Use of calculators is allowed.

Q.No	Question	CO	Marks
Q1	(a) Determine whether the vectors $u = (1, 2, 3)^T$ and $v = (2, 4, 6)^T$ are linearly independent. What is the dimension of $\text{span}\{u, v\}$?	CO1	[2]
	(b) A discrete random variable X takes values 0, 1, 2 with probabilities 0.2, 0.5, 0.3, respectively. Verify that this is a valid probability distribution. Compute $E[X]$ and $P(X \geq 1)$.		[3]
Q2	(a) Explain list slicing and dictionary access in Python. For <code>numbers=[10,20,30,40,50]</code> , write the outputs of <code>numbers[1:4]</code> and <code>numbers[::-1]</code> .	CO2	[3]
	(b) State one main use each of NumPy, Pandas, and Matplotlib. A DataFrame has <code>City=[A,B,A,B]</code> and <code>Marks=[80,70,90,60]</code> . Compute the mean marks for each city and state why <code>groupby()</code> is useful.		[4]
Q3	(a) Define feature, target, training set, and test set in machine learning. Why is a train-test split used?	CO2	[4]
	(b) Outline a basic Scikit-learn workflow: prepare X and y , split the data, create a model, apply <code>fit()</code> , use <code>predict()</code> , and evaluate performance. What do <code>fit()</code> and <code>predict()</code> do?		[3]
Q4	(a) Write the main Python/Scikit-learn steps needed to implement simple linear regression on arrays X and y .	CO3	[3]
	(b) A linear regression model is $\hat{y} = 5 + 2x$. For $x = [1, 2, 4]$, compute the predicted outputs. If the true outputs are $y = [8, 8, 14]$, compute the absolute error for each sample and the mean absolute error.		[5]
Q5	(a) Differentiate supervised and unsupervised learning. Under which category do classification, regression, and clustering fall?	CO4	[3]

Q.No	Question	CO	Marks
	(b) Select a suitable learning approach and justify briefly for each case: spam email detection, house-price prediction, customer segmentation, and grouping news articles without labels. State one advantage and one limitation of supervised learning compared with unsupervised learning.		[5]