JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-V Semester (CSE-AIML)

COURSE CODE (CREDITS): 19B1WCI738 (3) MAX. MARKS: 15

COURSE NAME: INTRODUCTION TO DEEP LEARNING

COURSE INSTRUCTOR: PROF. VIVEK KUMAR SEHGAL MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

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

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	(a) Explain the architecture of an Artificial Neural Network (ANN). Describe the role of the input layer, hidden layers, output layer, weights, biases, and activation functions. (b) Discuss the major applications of Deep Learning in areas such as computer vision, natural language processing, speech recognition, and recommendation systems. Explain how deep neural networks improve performance in these applications.	CO-1	5
Q2	(a) . Stochastic Gradient Descent updates each parameter using the gradient computed from a single training example: $\theta_{t+1} = \theta_t - \eta \cdot \nabla J(\theta_t; x_i, y_i)$ Compared with Batch Gradient Descent, which averages ∇J over the entire dataset before each update, what trade-offs does using a single-example gradient create between training speed, update stability, and how noisy the path toward the minimum is? (b) Momentum introduces a velocity term that accumulates an exponentially weighted average of past gradients: $v_t = \beta \cdot v_{t-1} + (1 - \beta) \cdot \nabla J(\theta_t) \qquad \theta_{t+1} = \theta_t - \eta \cdot v_t$ Here β (often 0.9) controls how much past gradient history carries forward. How does this term let the optimizer move faster through consistently sloped regions while damping oscillations across steep, narrow ravines in the loss surface?	CO-1,2	5
Q3	Consider the evaluation of E as given below, $E = g(x, y, z) = \sigma(c(ax + by) + dz)$ Here x, y, z are inputs (constants) and a, b, c, d are parameters (variables). σ is the logistic sigmoid function defined as:	CO-2	5

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	$$\sigma(x) = \frac{1}{1+e^{-x}}$$ Note that here E is a function of a, b, c, d. Compute the partial derivatives of E with respect to the parameters a, b and d i.e. $\frac{\partial E}{\partial a}, \frac{\partial E}{\partial b}$ and $\frac{\partial E}{\partial d}$.		

UNIT TEST-1 EXAMINATION-AUG-2026