



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.: 22 BDS02

SLOT:D1+TD1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING CONTINUOUS ASSESSMENT TEST - I FALL SEMESTER 2025-2026

Programme Name & Branch : B.Tech
Course Code and Course Name : BCSE332L Deep Learning
Faculty Name(s) : Dr.K.Kumar, Dr.T.Chellatamilan, Dr.Jyotismita Chaki, Dr.C.Sharmila
Class Number(s) : VL2025260102432, VL2025260101643, VL2025260101646, VL2025260101644
Date of Examination : 20.08.2025
Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes:
 1. Understand the methods and terminologies involved in deep neural network, differentiate the learning methods used in Deep-nets.
 2. Identify and apply suitable deep learning approaches for given application.

Q. No	Question	M	CO	BL
1.	A fintech company is using neural networks to detect fraudulent transactions from large-scale customer data. Initially, a model without proper activation functions could only separate simple transaction types and failed on complex fraud patterns. After updating the architecture with activation functions, the system showed improved sensitivity to anomalies. Based on this scenario, illustrate any 4 commonly used activation functions, including their mathematical forms with plots and also describe the necessity of activation functions in classification tasks.	10	1	3
2.	<p>Consider a neural network with 2 input neurons (1, 2), 2 hidden neurons (3, 4), and 1 output neuron (5). The network uses the sigmoid activation function. The weights are as follows: From inputs to hidden layer:</p> $W_{13} = 0.3, W_{14} = 0.5, W_{23} = 0.6, W_{24} = 0.4$ <p>From hidden to output layer: $W_{35} = 0.8, W_{45} = 0.2$</p> <p>The input vector is: $X = [x_1, x_2] = [0.5, 0.8]$</p> <p>The target output is: $y=0.4$ Use a learning rate $\eta=0.5$</p> <p>Employ the weight updating rule during backpropagation with Gradient Descent and any relevant loss function. Perform one forward pass and one backward pass on the network.</p>	10	1	5
3.	A data science team is developing a deep learning model to detect spam emails. During training, they adjust few hyperparameters to improve model performance. However, they also notice that the weights and biases inside the	10	1	3



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	layers keep changing as training progresses. With reference to the above scenario, illustrate on various hyperparameters that can be tuned to improve the spam detection model's performance considering the use case given.			
4.	<p>Consider the Loss function J with respect to Weight 'w' as given below</p> $J(w) = (w + 3)^2$ <p>Assume the following parameters of RMS Prop Optimizer of Artificial neural network, Initial Weight $w_0 = 0$, Learning Rate $\alpha = 0.1$, Weight Decay Rate $\beta = 0.9$, Recent initial history of squared gradients $S_0 = 0$, Smoothing factor $\epsilon = 10^{-8}$</p> <p>a) Determine the gradient of the loss function with respect to parameter 'w' and perform two iterations of weight updates (5 Marks)</p> <p>b) Visualize the plot of gradient of the loss vs weight (2 Marks)</p> <p>c) Give at least two comments on how RMSProp adapts the learning rate during training and prevents oscillations in the gradient updates. (3 Marks)</p>	10	2	5
5	A deep learning engineer is training a deep neural network to classify plant species from leaf images. During training, the model achieves very high accuracy on the training data but performs poorly on validation and test datasets. In another experiment, a smaller model with fewer layers shows low accuracy on both training and validation sets. Using the given case as a reference, enumerate at least three strategies of Regularization to address each of issues of Overfitting/ Underfitting in detail.	10	2	3