REG.NO.:

SLOT:D2+TD2

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

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

Programme Name & Branch	**: B.Tech**
Course Code and Course Name	**: BCSE332L Deep Learning**
Faculty Name(s)	**: Dr.H. Abdul Gaffar, Dr.K. Lavanya K, Dr.C. Sharmila**
Class Number(s)	**: VL2025260101645, VL2025260101642, VL2025260101647**
Date of Examination	**: 08.10.2025**
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:
  3. Design and develop custom Deep-nets for human intuitive applications.

Q. No	Question	M	CO	BL
1.	A Convolutional Neural Network (CNN) is being designed for image feature extraction. a) Consider a 2D input tensor of size 3×3. The convolution kernel has height = 2 and width = 2. Predict the output of the convolution operation. (3 Marks) Input, Kernel: $\begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix} * \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix} =$ b) A CNN has the following architecture: Layer 1: Filter size = 5×5, Number of filters = 5, Stride = 1, Padding = 0 Layer 2: Filter size = 5×5, Number of filters = 10, Stride = 2, Padding = 0 Layer 3: Filter size = 3×3, Number of filters = 20, Stride = 2, Padding = 0 The input is a 3-D image of size 41×41. Calculate the dimension of the vector after passing through the fully connected layer in the architecture. (7 Marks)	10	3	5
2.	A hospital is deploying a deep learning system to automatically detect tumors from MRI scans. The system must identify small and subtle anomalies with high precision while leveraging powerful GPU servers for training and inference. Compare AlexNet and InceptionNet in this context, discuss how their architectural differences and model depths influence the detection of subtle features. Also explain the impact of these architectures on model accuracy, interpretability, and training time when applied to medical imaging datasets.	10	3	2
3.	Analyze the limitations of a simple RNN and evaluate how BERT overcomes these challenges. In scenarios where a search engine receives partial queries such as "Top 10 [MASK] to visit in Japan," explain how Masked Language Modeling (MLM) enables BERT to generate meaningful predictions like "places," "cities," or "temples,".	10	3	4

REG.NO.:

SLOT:D2+TD2

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

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

4.	A smart farming company is training a simple Recurrent Neural Network (RNN) to predict soil moisture readings across short time intervals. The model has one input unit, one hidden unit with tanh activation, and one output unit with linear activation. It is trained for two time steps using Mean Squared Error (MSE) as the loss function. For one training sequence, the inputs are $x_1 = 2.0$ $x_2 = 1.0$ while the target outputs are $y_1^{true} = 1.5$ and $y_2^{true} = 2.5$ The initial hidden state is $h_0 = 0$ The parameters of the network are initialized as $W_x = 0.5$ (input-to-hidden weight), $W_h = 0.3$ (hidden-to-hidden weight), and $W_y = 1.0$ (hidden-to-output weight), with a learning rate of $\alpha = 0.05$ Based on this scenario, perform the forward pass to compute the hidden states and outputs, evaluate the total loss using MSE, apply Backpropagation Through Time (BPTT) to calculate the gradients of the weights, and update the parameters after one iteration of gradient descent.	10	3	5
5.	Analyze the sentiment of a 2-word sequence using a GRU. Consider a sentence: Read books Represent each word with a 1-dimensional embedding: Word | Embedding (x_t) Read | 0.4 books | 0.7 Assume that the initial hidden state is $h_0 = 0$ and bias terms are set to 0. Consider the below parameters. $W_z = W_r = W_h = 0.7$ $U_z = U_r = U_h = 0.3$ Show the intermediate values of the update gate z_t, reset gate r_t, and candidate hidden state $\tilde{h}_t$. Also compute the final hidden states (h_1 and h_2).	10	3	5

****