VIT
Vellore Institute of Technology

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
MID TERM EXAM
SUMMER SEMESTER 2024-2025

SLOT: G1+TG1+G2+TG2

Programme Name & Branch	: MDI
Course Code and Course Name	: MDI4009 & Neural Networks and Deep Learning
Faculty Name(s)	: Dr.A.Devipriya
Class Number(s)	: VL2024250700199
Date of Examination	: 11.06.2025
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. Identify and describe Artificial Neural Network techniques in building intelligent machines.
2. Model Neuron and Neural Network, and to analyze ANN learning, and its applications.
4. Develop different single layer/multiple layer Perceptron learning algorithms.

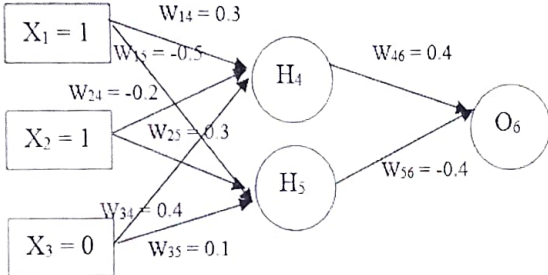| Q. No	Question	M	CO	BL
1.	a) You are given the following scenarios. Identify the learning method used and briefly justify your answer. 1. A robot is trained to navigate a maze by receiving rewards and penalties. 2. A clustering algorithm is used to segment customers based on their purchasing behaviour. 3. A model is trained to classify emails as spam or not spam using labeled examples. **Instructions:** • Name the learning method for each scenario (e.g., Supervised, Unsupervised, Reinforcement) • Justify each choice in 1–2 lines.	4	CO1	BL2
	b) Discuss the various classifications of neural networks based on their architecture and functionality. For each type, explain the underlying principles and provide suitable real-world examples to illustrate their applications.	6		
2.	Given that the neurons use a sigmoid activation function, with an actual target output of 1 and a learning rate of 0.8, first carry out a forward pass to obtain the network's predicted output. Then, using the backpropagation algorithm, perform a backward pass to compute the error gradients and update the weights accordingly. Once the weights	10	CO2	BL3

REG.NO.:

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have been updated, run a second forward pass to calculate the new output produced by the model.

#	Question	Marks	CO	BL
3.	Cluster the input vectors [0 0 1 0], [1 1 0 1], [0 1 1 0], [1 0 0 1] using an ART1 network with vigilance 0.4 and learning rate 1.2 into three clusters. Assign the inputs into appropriate clusters step by step, and explain how the vigilance test influences the category assignment and learning process.	10	CO1	BL3
4.	Construct the Kohonen Self-Organizing Map (SOM) with two cluster units and four training samples. Each vector is of length 3. The initial weight vectors for the cluster units are given as: Unit1 = [0.4, 0.6, 0.1], Unit2 = [0.7, 0.2, 0.5] Use the squared Euclidean distance to determine the winning cluster unit for each training sample. The training samples are: X1 = [1, 0, 0], X2 = [0, 1, 1], X3 = [1, 1, 0], X4 = [0, 0, 1] Use a learning rate α = 0.5, and compute the updated weight vector for the winning unit for sample X1.	10	CO2	BL3
5.	a) Explain and illustrate the different types of regularization techniques commonly used in deep learning. Provide examples to demonstrate how each technique helps in preventing overfitting and improving model generalization	5	CO4	BL2
	b) In the context of machine learning, how do parameters differ from hyperparameters? Discuss two widely used techniques for tuning hyperparameters, and analyze their benefits and drawbacks with suitable examples.	5		

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