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

REG.NO.: 23BDS0096

SLOT: D2

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

Programme Name & Branch	: B.Tech. - Computer Science and Engineering and Business Systems
Course Code and Course Name	: CBS3006 - Machine Learning
Faculty Name(s)	: Dr. NAGESHWAR RAO RAGI, Dr. KARTHIKEYAN A
Class Number(s)	: VL2025260502106, 2105
Date of Examination	: 30 Jan 2026
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 concepts of various machine learning strategies.
  2. Handle computational data and learn ANN learning models.
  3. Solve real world applications by selecting suitable learning model.

<table>
<tr><th>Q. No</th><th>Question</th><th>Module</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>1.</td><td>a) Define the terms: Most general hypothesis and Most specific hypothesis [4 Marks]
b) On the given data set below, apply 'FIND-S' algorithm to find the maximally specific hypothesis, by learning the target concept "Conditions when the Student passes the Exam". Also interpret the conclusion from the Final Maximally specific hypothesis. [6 Marks]
<table>
<tr><th>Example</th><th>Study Hours</th><th>Attendance</th><th>Sleep</th><th>Practice Tests</th><th>Pass Exam</th></tr>
<tr><td>1</td><td>High</td><td>Good</td><td>Adequate</td><td>Yes</td><td>Yes</td></tr>
<tr><td>2</td><td>High</td><td>Good</td><td>Poor</td><td>Yes</td><td>Yes</td></tr>
<tr><td>3</td><td>Medium</td><td>Good</td><td>Adequate</td><td>Yes</td><td>Yes</td></tr>
<tr><td>4</td><td>Low</td><td>Poor</td><td>Poor</td><td>No</td><td>No</td></tr>
<tr><td>5</td><td>Medium</td><td>Poor</td><td>Adequate</td><td>No</td><td>No</td></tr>
<tr><td>6</td><td>High</td><td>Good</td><td>Adequate</td><td>No</td><td>Yes</td></tr>
</table></td><td>1</td><td>10</td><td>1</td><td>2</td></tr>
<tr><td>2.</td><td>a) Given a class $\mathcal{C}$ of Boolean functions $f: \{0,1\}^n \rightarrow \{0,1\}$, when do you say that $\mathcal{C}$ is PAC learnable? [2 Marks]
b) A hypothesis h for 10 samples with the error tolerance $\epsilon = 0.02$, confidence $\delta = 0.25$ produced the following errors: $\{0.01, 0.025, 0.018, 0.021, 0.035, 0.015, 0.007, 0.016, 0.013, 0.036\}$. Check whether the hypothesis is Probably Approximately Correct. [3 Marks]
c) Define the VC dimension of a hypothesis space. [1 Mark] Show that the VC dimension of straight lines in a 2-D plane is 3 and that of axis-aligned rectangles is 4. [4 Marks]</td><td>1</td><td>10</td><td>1</td><td>3</td></tr>
</table>

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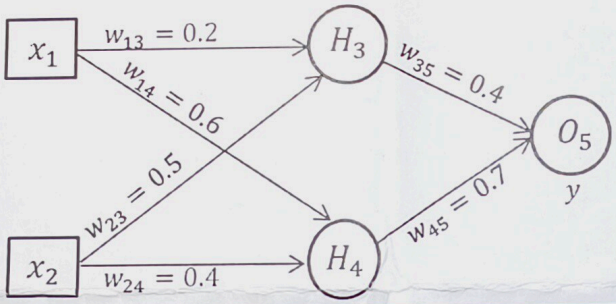
3.	a) Explain the term 'Curse of dimensionality' in Machine learning models. Discuss any three techniques for implementation of Wrapper methods with regard to dimensionality. [2+3 Marks] b) For the following data, find the interquartile range and hence find the outliers if any: {607, 835, 915, 642, 587, 1100, 618, 794, 629, 638, 739, 256, 356, 720} [5 Marks]	2	10	2	2
4.	Consider the multilayer feed-forward neural network illustrated in the figure below. Train the network with input values $x_1 = 0.3, x_2 = 0.8$ and the target output $y = 0.6$. Perform one forward pass and update the weights by using back-propagation algorithm. Consider the learning rate $\eta = 0.1$ and the initial weights as given in the figure. Assume Sigmoid activation function in the network.  	2	10	2	3
5.	'Safe braking distance' refers to the space you maintain between your vehicle and the one ahead. The safe braking distance (Y) in meters for certain speeds of vehicle (X) in mph are tabulated below: X: 20, 30, 40, 50, 60 Y: 12, 23, 24, 38, 55 a) Using this dataset, develop a simple linear regression model of the form $y = \beta_0 + \beta_1 x$, by method of deviations, to predict braking distance based on speed. [6 Marks] b) Make the predictions using the developed model for the given X values. [2 Marks] c) How large a part of the variation in speed can be explained by the distance? [2 Marks]	3	10	3	3

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