JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3EXAMINATIONS- 2026

B.Tech-VII Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WCI742 MAX MARKS: 35

COURSE NAME: ARTIFICIAL INTELLIGENCE

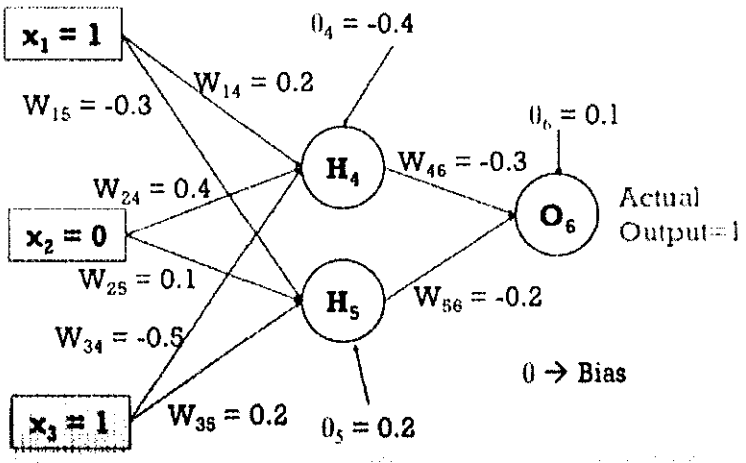
COURSE INSTRUCTOR: VANI SHARMA MAX. TIME: 2 Hours

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

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>Using the Naive Bayes algorithm, identify the Type of an entity withthe following attributes:Shape = Oval, Wings = 2, Size= Large, Venomous = No
<table>
<tr><th>Instance</th><th>Shape</th><th>Wings</th><th>Size</th><th>Venomous</th><th>Type</th></tr>
<tr><td>1</td><td>Round</td><td>4</td><td>Small</td><td>Yes</td><td>P</td></tr>
<tr><td>2</td><td>Oval</td><td>2</td><td>Large</td><td>No</td><td>P</td></tr>
<tr><td>3</td><td>Oval</td><td>4</td><td>Small</td><td>Yes</td><td>P</td></tr>
<tr><td>4</td><td>Round</td><td>4</td><td>Small</td><td>Yes</td><td>P</td></tr>
<tr><td>5</td><td>Oval</td><td>2</td><td>Small</td><td>No</td><td>Q</td></tr>
<tr><td>6</td><td>Round</td><td>2</td><td>Large</td><td>No</td><td>Q</td></tr>
<tr><td>7</td><td>Round</td><td>2</td><td>Large</td><td>No</td><td>Q</td></tr>
<tr><td>8</td><td>Round</td><td>2</td><td>Small</td><td>Yes</td><td>Q</td></tr>
</table></td><td>2</td><td>[7]</td></tr>
<tr><td>Q2</td><td>Consider the following dataset that predicts whether a student Passes (Yes/No) an exam based on their Study Hours (Many, Some, Few) and whether they Attended Class (True/False).
<table>
<tr><th>Instance</th><th>Study Hours</th><th>Attended Class</th><th>Passes</th></tr>
<tr><td>1</td><td>Many</td><td>True</td><td>Yes</td></tr>
<tr><td>2</td><td>Many</td><td>False</td><td>Yes</td></tr>
<tr><td>3</td><td>Some</td><td>True</td><td>Yes</td></tr>
<tr><td>4</td><td>Some</td><td>False</td><td>No</td></tr>
<tr><td>5</td><td>Some</td><td>True</td><td>Yes</td></tr>
<tr><td>6</td><td>Few</td><td>True</td><td>No</td></tr>
<tr><td>7</td><td>Few</td><td>False</td><td>No</td></tr>
<tr><td>8</td><td>Few</td><td>False</td><td>No</td></tr>
</table>
a) Compute the entropy H(Passes) for the entire dataset.
b) Compute the conditional entropy H(Passes | Study Hours) and</td><td>4</td><td>[7]</td></tr>
</table>

	H(Passes | Attended Class), then find the Information Gain for each attribute. Which attribute should be chosen as the root of the decision tree? c) Draw the complete decision tree learned from this dataset, showing all internal nodes, branch labels, and leaf nodes.		
Q3	a) Explain the concepts of overfitting and underfitting in terms of bias and variance, and discuss the bias–variancetrade-off. Also, describe how these phenomena affect model performance and generalization. b) Explain the concept of evaluation metrics in machine learning, including accuracy, precision, recall, and F1-score, and describe the role of a confusion matrix in computing and interpreting these metrics. Additionally, discuss the advantages of the F1-scoreover accuracy.	5	[3+3]
Q4	Consider the following ANN model with backpropagation algorithm. Weights and biases are given in the figure. The network uses the sigmoid as an activation function. Use the given information to compute the output of each neuron during the forward pass and then calculate the error term for each neuron using the backpropagation algorithm and update the parameters for one iteration using **learning rate (η) = 0.1.**  	5	[10]
Q5	Explain the PEAS framework used to describe intelligent agents, where PEAS stands for Performance measure, Environment, Actuators, and Sensors, and apply it to design an agent for online product recommendation. Additionally, distinguish between reflex agents, goal-based agents, and utility-based agents, providing one example for each.	1	[5]