



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

SLOT: C1+TC1

Programme Name & Branch : B.Tech. Information Technology
Course Code & Course Name : BITE410L & Machine Learning
Faculty Name(s) : Dr. Selva Rani B, Dr. Prabhavathy P
Class Number(s) : VL2025260103200, VL2025260103192
Date of Examination : October 7, 2025
Exam Duration : 90 minutes

Maximum Marks: 50

General instructions:

- Answer All the Questions. You are expected to solve the **numerical problems step by step**.
- M-Max mark; CO-Course Outcome; BL-Blooms Taxonomy Level (1-Remember, 2-Understand, 3-Apply, 4-Analyse, 5-Evaluate, 6-Create)
- Course Outcomes:
CO2 – Develop the learning models for the problems using supervised and advanced learning-based approaches

Q. No	Question	Mark	CO	BL																																																																																										
1.	Consider the data samples as given below for the target class <i>PlayTennis</i>. <table><tr><th>SNo.</th><th>Outlook</th><th>Temperature</th><th>Humidity</th><th>Wind</th><th>PlayTennis</th></tr><tr><td>D1</td><td>Sunny</td><td>Hot</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D2</td><td>Sunny</td><td>Hot</td><td>High</td><td>Strong</td><td>No</td></tr><tr><td>D3</td><td>Overcast</td><td>Hot</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D4</td><td>Rain</td><td>Mild</td><td>High</td><td>Weak</td><td>Yes</td></tr><tr><td>D5</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D6</td><td>Rain</td><td>Cool</td><td>Normal</td><td>Strong</td><td>No</td></tr><tr><td>D7</td><td>Overcast</td><td>Cool</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D8</td><td>Sunny</td><td>Mild</td><td>High</td><td>Weak</td><td>No</td></tr><tr><td>D9</td><td>Sunny</td><td>Cool</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D10</td><td>Rain</td><td>Mild</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D11</td><td>Sunny</td><td>Mild</td><td>Normal</td><td>Strong</td><td>Yes</td></tr><tr><td>D12</td><td>Overcast</td><td>Mild</td><td>High</td><td>Strong</td><td>Yes</td></tr><tr><td>D13</td><td>Overcast</td><td>Hot</td><td>Normal</td><td>Weak</td><td>Yes</td></tr><tr><td>D14</td><td>Rain</td><td>Mild</td><td>High</td><td>Strong</td><td>No</td></tr></table> Apply ID3 to the above samples and find the topmost node of the decision tree. Draw the partial decision tree obtained using that root node. What would be the features you will choose further to be expanded? Justify in detail.	SNo.	Outlook	Temperature	Humidity	Wind	PlayTennis	D1	Sunny	Hot	High	Weak	No	D2	Sunny	Hot	High	Strong	No	D3	Overcast	Hot	High	Weak	Yes	D4	Rain	Mild	High	Weak	Yes	D5	Rain	Cool	Normal	Weak	Yes	D6	Rain	Cool	Normal	Strong	No	D7	Overcast	Cool	Normal	Strong	Yes	D8	Sunny	Mild	High	Weak	No	D9	Sunny	Cool	Normal	Weak	Yes	D10	Rain	Mild	Normal	Weak	Yes	D11	Sunny	Mild	Normal	Strong	Yes	D12	Overcast	Mild	High	Strong	Yes	D13	Overcast	Hot	Normal	Weak	Yes	D14	Rain	Mild	High	Strong	No	15	2	4
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2.	The following table shows a training data samples of bank loan applications with the target label "RiskClass". <table><tr><th>SNo.</th><th>OwnsHome</th><th>Married</th><th>Employed</th><th>CreditScore</th><th>RiskClass</th></tr><tr><td>1</td><td>Yes</td><td>Yes</td><td>Yes</td><td>High</td><td>LowRisk</td></tr><tr><td>2</td><td>No</td><td>No</td><td>Yes</td><td>Low</td><td>HighRisk</td></tr><tr><td>3</td><td>Yes</td><td>No</td><td>No</td><td>High</td><td>HighRisk</td></tr><tr><td>4</td><td>Yes</td><td>Yes</td><td>Yes</td><td>High</td><td>LowRisk</td></tr><tr><td>5</td><td>No</td><td>Yes</td><td>Yes</td><td>Low</td><td>HighRisk</td></tr><tr><td>6</td><td>Yes</td><td>No</td><td>Yes</td><td>High</td><td>LowRisk</td></tr><tr><td>7</td><td>No</td><td>No</td><td>No</td><td>Low</td><td>HighRisk</td></tr><tr><td>8</td><td>Yes</td><td>Yes</td><td>Yes</td><td>High</td><td>LowRisk</td></tr><tr><td>9</td><td>No</td><td>Yes</td><td>No</td><td>Low</td><td>HighRisk</td></tr><tr><td>10</td><td>Yes</td><td>No</td><td>Yes</td><td>High</td><td>LowRisk</td></tr></table> (a) Compute the prior probabilities for each class (LowRisk, HighRisk) [2 Marks] (b) Construct the frequency table and compute the likelihood probabilities of each feature value given the class. [8 Marks]	SNo.	OwnsHome	Married	Employed	CreditScore	RiskClass	1	Yes	Yes	Yes	High	LowRisk	2	No	No	Yes	Low	HighRisk	3	Yes	No	No	High	HighRisk	4	Yes	Yes	Yes	High	LowRisk	5	No	Yes	Yes	Low	HighRisk	6	Yes	No	Yes	High	LowRisk	7	No	No	No	Low	HighRisk	8	Yes	Yes	Yes	High	LowRisk	9	No	Yes	No	Low	HighRisk	10	Yes	No	Yes	High	LowRisk	15	2	5																								
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7	No	No	No	Low	HighRisk																																																																																									
8	Yes	Yes	Yes	High	LowRisk																																																																																									
9	No	Yes	No	Low	HighRisk																																																																																									
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VIT

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

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	(c) For a new applicant with the following attributes, use Naive Bayes classifier to compute the posterior probabilities for both classes (LowRisk, HighRisk) [5 Marks] {OwnsHome = No, Married = Yes, Employed = Yes, CreditScore = Low}																															
3.	Consider a two-layer feed forward Artificial Neural Network with two inputs a and b , one hidden unit c , and one output unit d . This network has five weights w_{ca} , w_{cb} , w_{cd} , w_{da} , w_{db} . Initialize these weights to the values $(.1, .1, .1, .1, .1)$. Sketch the structure by labelling all the required details. By assuming the learning rate as 0.3 compute output from the neural network using sigmoid activation, find the error at each responsive node and do the required weight/bias updates by assuming the training sample, $(a=1, b=0, d=1)$.	10	2	5																												
4.	Consider the following training set in a 2D Plane: <table><tr><th>Sample</th><th>x_1</th><th>x_2</th><th>Class</th></tr><tr><td>1</td><td>2</td><td>3</td><td>+1</td></tr><tr><td>2</td><td>3</td><td>3</td><td>+1</td></tr><tr><td>3</td><td>4</td><td>4</td><td>+1</td></tr><tr><td>4</td><td>2</td><td>1</td><td>-1</td></tr><tr><td>5</td><td>3</td><td>1</td><td>-1</td></tr><tr><td>6</td><td>4</td><td>2</td><td>-1</td></tr></table> a) Show that the data are linearly separable [2 Marks] b) Investigate the Support Vectors [2 Marks] c) Find the optimal separating hyperplane [4 Marks] d) Compute the margin (distance from hyperplane to nearest point) [2 Marks]	Sample	x_1	x_2	Class	1	2	3	+1	2	3	3	+1	3	4	4	+1	4	2	1	-1	5	3	1	-1	6	4	2	-1	10	2	5
Sample	x_1	x_2	Class																													
1	2	3	+1																													
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6	4	2	-1																													
