U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 22AS7PEMLA **Max Marks: 100**

Course: Machine Learning in Aerospace Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Distinguish between supervised and unsupervised techniques with a suitable example for each.	*CO1*	*PO1*	**8**
	b)	Infer the characteristics of different types of ML techniques with a neat sketch.	*CO1*	*PO1*	**6**
	c)	Explain the importance of Stochastic Optimization with the help of an example.	*CO1*	*PO1*	**6**
		OR			
2	a)	Define machine learning. Explain how it differs from traditional programming using block diagrams.	*CO1*	*PO2*	**6**
	b)	Explain the concept of reinforcement learning and illustrate the interactions of its core components during the learning process with an example.	*CO1*	*PO2*	**6**
	c)	What are the implications of the advantages and disadvantages of deep learning for its adoption in real-world applications?	*CO1*	*PO2*	**8**
		UNIT - II			
3	a)	Explain the different types of support vector machines with a neat sketch.	*CO1*	*PO1*	**6**
	b)	How does principal component analysis help in reduction of the computational cost of optimizing aircraft wing shapes under varying flow conditions?	*CO1*	*PO1*	**8**
	c)	Outline the importance of sigmoid function in logistic regression.	*CO1*	*PO1*	**6**
		OR			

<table>
<tr><td></td><td>4</td><td>a)</td><td>What are soft margins in Support Vector Machines and how do we represent mathematically? Illustrate with an example.</td><td>CO1</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>A company recorded the following weather data of five days temperature in Fahrenheit scale.
<table><tr><td>Day(x)</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Temperature(y)</td><td>30</td><td>70</td><td>50</td><td>80</td><td>60</td></tr></table>Apply the Simple Linear Regression to:
i. Find the linear regression equation for the data.
ii. Predict the temperature of Day 6 and Day 7 respectively.</td><td>CO1</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - III</td><td></td><td></td><td></td></tr>
<tr><td></td><td>5</td><td>a)</td><td>Illustrate the general structure of decision tree with suitable example.</td><td>CO2</td><td>PO1</td><td>5</td></tr>
<tr><td></td><td></td><td>b)</td><td>Find the entropy of the given probabilities
<table><tr><td>P1</td><td>P2</td><td>P3</td><td>P4</td></tr><tr><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td></tr></table></td><td>CO2</td><td>PO2</td><td>5</td></tr>
<tr><td></td><td></td><td>c)</td><td>Design a decision tree for the given dataset using the ID3 algorithm.
<table><tr><td>Instance</td><td>A1</td><td>A2</td><td>Classification</td></tr><tr><td>1</td><td>False</td><td>True</td><td>$</td></tr><tr><td>2</td><td>False</td><td>True</td><td>$</td></tr><tr><td>3</td><td>False</td><td>False</td><td>+</td></tr><tr><td>4</td><td>True</td><td>False</td><td>$</td></tr><tr><td>5</td><td>True</td><td>True</td><td>+</td></tr><tr><td>6</td><td>True</td><td>True</td><td>+</td></tr></table></td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>Elucidate on different Hypothesis Space Search in Decision Tree Learning.</td><td>CO2</td><td>PO1</td><td>8</td></tr>
<tr><td></td><td></td><td>b)</td><td>List down the attribute measures used by the ID3 algorithm to construct a decision tree.</td><td>CO2</td><td>PO1</td><td>8</td></tr>
<tr><td></td><td></td><td>c)</td><td>Outline the pertinent issues involved in decision tree learning.</td><td>CO2</td><td>PO1</td><td>4</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Describe ANN with artificial Neuron.</td><td>CO2</td><td>PO1</td><td>6</td></tr>
<tr><td></td><td></td><td>b)</td><td>Illustrate back propagation algorithm with an example.</td><td>CO2</td><td>PO2</td><td>14</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>8</td><td>a)</td><td>Illustrate the neural network representation, highlighting the role of input, hidden, and output layers in problem-solving.</td><td>CO2</td><td>PO1</td><td>7</td></tr>
<tr><td></td><td></td><td>b)</td><td>Elucidate on multilayer perceptrons (MLPs) and justify the statement “MLPs are more powerful than single layer perceptron”.</td><td>CO2</td><td>PO1</td><td>8</td></tr>
</table>

		c)	List and explain key challenges in training neural networks.	*CO2*	*PO1*	**5**
			UNIT - V			
	9	a)	Explain Naive Bayes Classifier with its advantage and disadvantages.	*CO3*	*PO1*	**10**
		b)	A diagnostic test has 99% accuracy, and 60% of people have Covid-19. If a patient tests positive, what is the probability they actually have the disease?	*CO3*	*PO2*	**10**
			OR			
	10	a)	Comprehend the Minimum Description Length (MDL) principle and discuss its application in model selection with an example.	*CO3*	*PO1*	**8**
		b)	Explain the working of the Gibbs algorithm in Bayesian learning. Highlight its computational aspects.	*CO3*	*PO1*	**6**
		c)	Differentiate between Maximum Likelihood Estimation (MLE) and Least-Squared Error hypotheses.	*CO3*	*PO1*	**6**

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