U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

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

Branch: Institutional Elective **Duration: 3 hrs.**

Course Code: 22IS7OEMLG **Max Marks: 100**

Course: Machine Learning

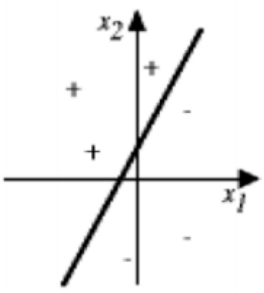
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

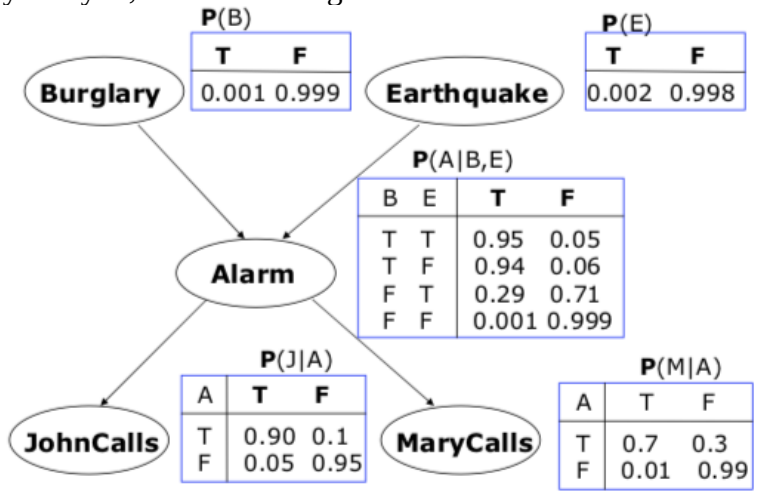
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Define well posed learning problem and robot driving learning problem.	CO1	PO1	05
	b)	Discuss about the fields related to Machine learning.	CO1	PO1	05
	c)	Apply candidate elimination algorithm to learn the concept of "Japanese Economy Car".	CO1	PO2	10

Origin	Manufacturer	Color	Decade	Type	Example Type
Japan	Honda	Blue	1980	Economy	Positive
Japan	Toyota	Green	1970	Sports	Negative
Japan	Toyota	Blue	1990	Economy	Positive
USA	Chrysler	Red	1980	Economy	Negative
Japan	Honda	White	1980	Economy	Positive

		OR			
2	a)	Write and explicate on list-then-eliminate algorithm.	CO1	PO1	05
	b)	Describe the Find-S algorithm with an example.	CO1	PO1	05
	c)	Discuss the following with respect to machine learning. i. Choosing the training experience ii. Choosing the target function iii. Choosing a function approximation algorithm.	CO1	PO1	10
		UNIT - II			
3	a)	Define Entropy and Information gain. Write and explain ID3 algorithm specialized to learning Boolean-valued functions.	CO1	PO1	10

		b)	<table><tr><th>Age</th><th>Competition</th><th>Type</th><th>Profit</th></tr><tr><td>Old</td><td>Yes</td><td>Software</td><td>Down</td></tr><tr><td>Old</td><td>No</td><td>Software</td><td>Down</td></tr><tr><td>Old</td><td>No</td><td>Hardware</td><td>Down</td></tr><tr><td>Mid</td><td>Yes</td><td>Software</td><td>Down</td></tr><tr><td>Mid</td><td>Yes</td><td>Hardware</td><td>Down</td></tr><tr><td>Mid</td><td>No</td><td>Hardware</td><td>Up</td></tr><tr><td>Mid</td><td>No</td><td>Software</td><td>Up</td></tr><tr><td>New</td><td>Yes</td><td>Software</td><td>Up</td></tr><tr><td>New</td><td>No</td><td>Hardware</td><td>Up</td></tr><tr><td>New</td><td>No</td><td>Software</td><td>Up</td></tr></table> Construct the decision tree using ID3 algorithm for the target concept Profit.	*CO2*	*PO2*	**10**
			OR				
	4	a)	Give decision trees to represent the following boolean functions: (*a*) $A \wedge \neg B$ (*b*) $A \vee [B \wedge C]$ (*c*) $A\ XOR\ B$ (*d*) $[A \wedge B] \vee [C \wedge D]$	*CO2*	*PO2*	**10**
		b)	Analyze the Decision Tree Algorithm in detail with an example.	*CO1*	*PO1*	**05**
		c)	List down the advantages of the Decision Trees.	*CO1*	*PO1*	**05**
			UNIT - III				
	5	a)	Describe perceptron training rule with an example.	*CO1*	*PO1*	**05**
		b)	Write and explain the steps in back propagation algorithm which uses stochastic gradient descent method.	*CO1*	*PO1*	**10**
		c)	Consider the function $y=(x+5)^2$. Perform 2 iterations of gradient descent by assuming a learning rate of 0.01 and starting random point of x = -3.	*CO2*	*PO2*	**05**
			OR				
	6	a)	Compute the values of weights w_0, w_1 and w_2 for the perceptron whose decision surface is illustrated in the following figure. Assume the surface crosses the x1 axis at -1 and x2 axis at 2. 	*CO3*	*PO2*	**05**
		b)	Discuss Artificial Neural Networks explaining their structure working principles and application with an example.	*CO1*	*PO1*	**05**

		c)	Implement OR function using Perceptron training rule with W1=0.6, W2=0.6, threshold=1 and learning rate to 0.5.	*CO2*	*PO2*	**10**
			UNIT - IV			
	7	a)	Explain Expectation Maximization Algorithm.	*CO1*	*PO1*	**10**
		b)	Assume your house has an alarm system against burglary. You live in the seismically active area and the alarm system can get occasionally set off by an earthquake. You have two neighbours, Mary and John, who do not know each other. If they hear the alarm they call you, but this is not guaranteed.  Using Bayes Belief Network, Find the probability of both John and Mary calls, the alarm goes off, but there is no earthquake or burglar.	*CO3*	*PO2*	**10**
			OR			
	8	a)	Write and explicate naive Bayes algorithms for learning and classifying text.	*CO1*	*PO1*	**10**
		b)	Classify a new sentence “Chinese Chinese Chinese Tokyo Japan” to one of the two predefined classes ‘C’ or ‘J’ using naive bayes classifier by considering the following training data. **Doc** | **Words** | **Class** 1 | Chinese Beijing Chinese | C 2 | Chinese Chinese Shanghai | C 3 | Chinese Macao | C 4 | Tokyo Japan Chinese | J	*CO2*	*PO2*	**10**
			UNIT - V			
	9	a)	Discuss reinforcement learning in detail along with the various elements involved in forming the concept. Also define what is meant by partially observable state.	*CO1*	*PO1*	**10**
		b)	Elucidate Q-learning algorithm.	*CO1*	*PO1*	**05**

		c)	Suppose that you have the following data from a paper tissue factory: <table><tr><th>Acid Durability (Seconds)</th><th>Strength(Kg/Sq m)</th><th>Classification</th></tr><tr><td>7</td><td>7</td><td>Bad</td></tr><tr><td>7</td><td>4</td><td>Bad</td></tr><tr><td>3</td><td>4</td><td>Good</td></tr><tr><td>1</td><td>4</td><td>Good</td></tr></table> Apply K-Nearest Neighbor algorithm to classify the following data as good or bad. Assume K=3. Acid Durability =3 and Strength=7 for test sample.	*CO2*	*PO2*	**05**
			OR			
	10	a)	Write and explain KNN-classification algorithm. Apply the same classification algorithm on following dataset to predict the class of FoodType to which tomato (Sweet=6, Crunch=4) belongs. <table><tr><th>Ingredient</th><th>Sweet</th><th>Crunch</th><th>FoodType</th></tr><tr><td>Grape</td><td>8</td><td>5</td><td>Fruit</td></tr><tr><td>Green Bean</td><td>3</td><td>7</td><td>Vegetable</td></tr><tr><td>Nuts</td><td>3</td><td>6</td><td>Protein</td></tr><tr><td>Orange</td><td>7</td><td>3</td><td>Fruit</td></tr></table>	*CO2*	*PO2*	**10**
		b)	Explicate key aspects of Analytical learning.	*CO1*	*PO1*	**10**

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