KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023
(Regulation 2018)
Fifth /Seventh Semester
ELECTRONICS AND COMMUNICATION ENGINEERING
U18ECE0014**:** Machine Learning

COURSE OUTCOMES

CO1: Compare the various learning methods.
CO2: Compare and apply neural network-based learning algorithm.
CO3: Apply appropriate linear model for a given application.
CO4: Apply probabilistic, clustering techniques for suitable application.
CO5: Utilize feature reduction technique for different applications.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate between Bias and Variance.	CO1	[K_2]
2.	Recall Vapnik-Chervonenkis Bound (VC Bound) for generalization.	CO1	[K_1]
3.	Explain the concept of linearly separability.	CO2	[K_2]
4.	Distinguish between MLP network with single hidden layer and Generalized radial-basis function networks.	CO2	[K_2]
5.	Identify the similarity between Least Squares and Maximum Likely-hood methods in linear regression.	CO3	[K_3]
6.	Why is SVM called as maximum margin classifier?	CO3	[K_3]
7.	Explain the need of dimensionality reduction in machine learning.	CO4	[K_2]
8.	What is Self- Organized feature map?	CO4	[K_1]
9.	Differentiate between directed and undirected graph.	CO5	[K_2]
10.	What are Markov Random Fields?	CO5	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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11.	a)	Define Machine learning? Compare various types of learning.	8	CO1	[K_2]
	b)	Explain the concept of Reinforcement learning with an example and illustrations	8	CO1	[K_2]
12.	a)	The 3 x3 patterns of 4 alphabets are given below. Apply HEBB net to detect the alphabet X.	8	CO2	[K_3]

Pattern X	Pattern O	Pattern N	Pattern V
# o # o # o # o #	# # # # o # # # #	# o # # # # # o #	# o # # o # o # o

b) Design an RBF network to implement the X-OR gate. Use simple Gaussian function as RBF and choose the initial centers randomly.   8   CO2   [K₃]

13. a) Explain the Linear Regression using least squares method.   8   CO3   [K₃]
Also, for data points {(0,2), (1,3), (2,5), (3,4), (4,6)},
a) Find the least square regression line $y = a x + b$.
b) Estimate the value of y when x = 10.

b) Explain the Fisher's Linear Discriminant classification model for two classes and multiple classes.   8   CO3   [K₂]

14. a) Summarize the steps involved in K-means clustering algorithm.   8   CO4   [K₃]
b) Apply K-means algorithm to cluster the data given below into two clusters.   8   CO4   [K₃]

Data Record	1	2	3	4	5	6	7
Variable 1	1	1.5	3	5	3.5	4.5	3.5
Variable 2	1	2	4	7	5	5	4.5

15. a) Explain in detail Classification And Regression Tree (CART).   8   CO5   [K₂]
b) Explain Emission and Transition probabilities with respect to HMM. Also determine, 1. Initial state matrix, 2. State transition matrix, 3. Emission matrix for the HMM state machine given below.   8   CO5   [K₃]
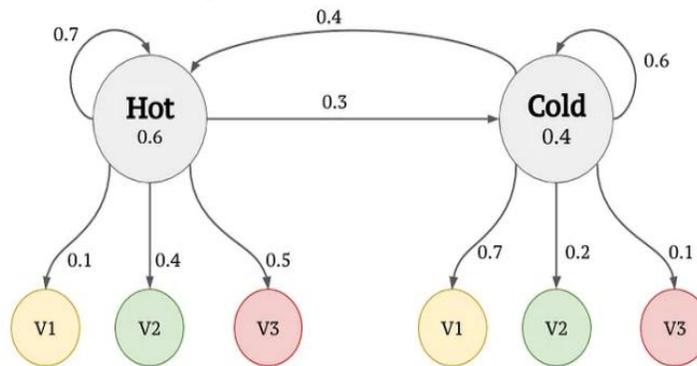
16. a) Apply Perceptron learning algorithm to single layer feed forward network to implement an Odd Parity Checker for an input consisting of 3 bits including 2 bit data and a parity bit as MSB (PD1D0). Assume the initial weights are zero and learning rate 1. Show the calculations for one iteration.   8   CO2   [K₃]

b) With appropriate diagrams explain how the Back Propagation Learning algorithm could be used to train a Multi Layer Perceptron network.   8   CO2   [K₂]

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