Total No. of Printed Pages: 2

PRN No.		PAPER CODE	U313 - 293 - ESE

December 2023 (ENDSEM) EXAM

TY (SEMESTER - I)

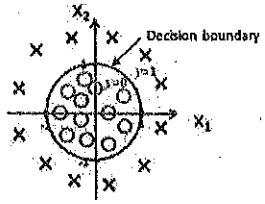
COURSE NAME: MACHINE LEARNING **Branch: ELECRONICS AND TELECOMMUNICATION** **COURSE CODE: ETUA 31203**

(PATTERN 2020)

Time: [1Hr. 30 Min] **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4,5 and 6 respectively.**

Q. No.		Question Description	Max. Marks	CO mapped	BT Level
Q.1	a)	In a certain linear machine learning model, to avoid overfitting a regularizer with $\lambda = 0.05$ is used. The parameter has a value of 1 and MSE is 0.025. Calculate the total loss.	[2]	CO1	Apply
Q2	a)	In a univariate linear regression model with θ_0=1, θ_1=2 and x= 1.Calculate the output of model when passed through sigmoid activation.	[2]	CO2	Apply
Q3.	a)	Support Vector Machines are often called as Kernel machine. Justify this statement. How SVM handles multiclass problems?	[6]	CO3	Analyze /Under stand
	b)	A nonlinear classification problem is as shown in the figure ,the model equation is given by $y(X,\theta) = \theta_0 + \theta_1.x_1 + \theta_2.x_2 + \theta_3.x_1^2 + \theta_4.x_2^2$  and the decision boundary is a circle with radius = 1, Suggest the values of the parameters θ_0,*to* θ_4,to generate the decision boundary. Draw the neural model with one neuron for implementation of this classifier.	[6]	CO3	Apply
Q.4	a)	You want to compress an image of 100x100 size with a compression ratio of 5 using Principal component analysis	[5]	CO4	Apply

		(PCA). Write PCA algorithm and determine number of principal components required to achieve the desired compression ratio.			
	b)	Compare Linear Discriminant Analysis (LDA) and Principal Component analysis (PCA).(At least five points)	[5]	CO4	Analyze
	c)	In machine learning it is said that," High Dimensionality is a Curse". Justify the statement.	[5]	CO4	Under-stand
Q.5	a)	"Activations functions used in multilayer perceptron must be continuous, differentiable and easy to compute". Justify the above statement.	[5]	CO5	Under-Stand
	b)	Draw the neural network with single input, one hidden layer neuron (no bias) and single output layer. Prepare equations for gradient descent using back propagation and write update equation. The activation function used is sigmoid in hidden and output layer	[5]	CO5	Create
	c)	In a certain multilayer perceptron training, the exponential learning rate scheduling is used. If training starts at t=0 and initial learning rate is 0.1, what will be the learning rate at t=5 and 10 epochs/steps.	[5]	CO5	Apply
Q.6)	a)	Convolution neural networks (CNN) have convolution and pooling layers. What is the role of pooling layer? Does pooling layer have trainable parameters? Comment. Draw a simple CNN architecture used for digit classification.	[5]	CO6	Under-Stand
	b)	Given a 128 x 128x 3 image and 16 filters of size 5 x 5, Compute the dimension of the output volume when a stride of 1 and a padding of 0 is considered? What is the effect of increasing size of the filters on accuracy of the classification? Comment.	[5]	CO6	Apply
	c)	Compare Multilayer Neural Networks and Convolution Neural Networks used for image classification.	[5]	CO6	Analyze