Nirma University

Institute of Technology

Supplementary Examination (SPE), February - 2025

B. Tech. in Computer Science and Engineering, Semester-V

Int. B. Tech. (CSE) - MBA, Semester-V

3CS101CC24 Machine Learning

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:
1. Attempt all questions.
2. Figures to the right indicate full marks.
3. Assume suitable assumptions and specify them.
4. Section-wise separate answer book to be used.

Section – I

Q-1. CO2,BL4 Consider the data given in the following table. **[20]**

GDP (x)	4_Wheeler_Passenger_Vehicle_Sale (in Thousand) (y)
5.8	25.5
6.1	26.1
5.4	24.7
6.3	26.4
7.0	27

Fit a first-order regression model to the data ($y = \beta 0 + \beta 1x$). Estimate parameters of the model ($\beta 0$ and $\beta 1$) through one epoch (one complete pass through the training set) of batch gradient descent and stochastic gradient descent, assuming learning rate = 0.01. Assume the initial value of $\beta 0$ and $\beta 1$ to be 2 and 5, respectively. The loss function is (1/2)*(mean squared error).

Q-2. Do as directed. **[15]**

A) CO3,BL2 Discuss simple competitive learning neural network and self organizing maps in detail. Compare and contrast self organizing maps with ANN. [09]

B) CO2,BL2 Discuss the bootstrap method in detail with an example. [06]

Q-3. Answer the following. **[15]**

A) CO1,BL2 Explain techniques for learning from labelled and unlabelled data in semi-supervised learning. [08]

B) CO3,BL4 Both k-means and hierarchical clustering algorithms can perform effective clustering. Illustrate the strengths and weaknesses of these algorithms. Write algorithms for k-means clustering. [07]

Section – II

Q-4. Do as directed. **[12]**

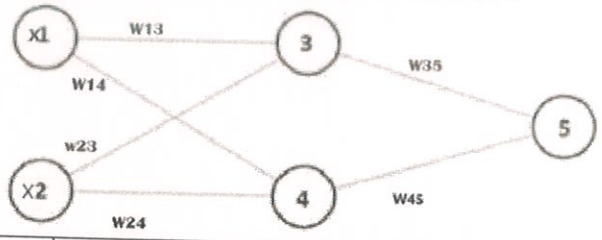
A) CO2,BL1 What is SVM? Explain it in detail. Discuss different types of kernels in SVM in detail. [06]

B) CO1,BL1 What is Normal Equation? Where will it be useful? [06]

Q-5. Do as directed. **[18]**

A) CO1,BL2 What is perceptron? Explain how it works. Also, explain the perceptron learning rule with an appropriate example. [08]

B) CO2,BL4 Consider the following feed-forward neural network. [10]



Input		Weight					
X1	X2	W13	W14	W23	W24	W35	W45
0.6	0.8	0.1	0.4	0.8	0.6	0.3	0.7

Assume that the neurons have a sigmoid activation function, perform a forward pass and a backward pass on the network. Assume that the actual output y is 0.7 and the learning rate is 1.

Q-6. CO3,BL4 Using the Decision Tree classifier algorithm and the following training data, find the class label for a test record {Credit Score=Medium, Income Level=High, Loan Amount=Low, Debt=Medium, Approved=?}. Build the entire Decision tree by using Information Gain. **[20]**

Credit Score	Income Level	Loan Amount	Debt	Approved
High	High	Low	Low	Yes
Medium	Medium	Medium	High	No
Low	Low	High	High	No
High	Medium	Low	Low	Yes
Medium	High	Medium	Medium	Yes
Low	Medium	High	High	No
High	High	Medium	Low	Yes
Medium	Low	Low	High	No
Low	High	Low	Medium	Yes
High	Medium	High	Medium	Yes