(Computer Science and Engineering)

Machine Learning (17ECSC306)

Duration: 3 hours **Max. Marks: 100**

Note: *i) Answer any TWO full questions from UNIT-I, any TWO full questions from UNIT-II and any ONE full question from UNIT-III.*

UNIT-I

1 a. List and explain the various cases where Linear regression fails over Logistic Regression and vice versa. Justify your answers considering appropriate datasets and hypothesis. (10marks)

b. Explain the importance of regularization. Describe how regularization is used in Linear and Logistic Regression to overcome over-fitting problem. (10marks)

2 a. Write a program to generate the TensorBoard graph for below algebraic equation. $(a+b+c)^2 = a^2 + b^2 + c^2 + + 2ab + 2bc + 2ca$ (10marks)

b. Consider the Table -1 describing the input (x_1, x_2) and output of Linear Regression algorithm. Calculate error $J(\Theta)$ considering the value of $\Theta_1=1$, $\Theta_2=2$ and $\Theta_3=3$.

x_1	x_2	Y
2	4	6
4	8	12
6	12	18
8	16	24

Table 1 (10marks)

3 a. Design a system which predicts traffic pattern at busy intersection using Machine Learning technique and explain what will be the experience E to Learn task T in improving the Performance P for the system. (10marks)

b. Explain the univariate regression. How does the model change for multivariate Linear Regression? Discuss the effect of polynomial regression on the learning. (10marks)

UNIT-II

4 a. Apply Support Vector Machine (SVM) algorithm for the data points in table -2 and calculate the dimension of hyperplane to classify them.

X	Y	Label
2	1	-1
2	-1	-1
4	1	-1
4	-1	-1
6	0	1
7	1	1
7	-1	1

Table 2 (10marks)

b. List and explain the steps involved in training a artificial neural network from scratch. Describe the effects of learning rate and number of hidden layers on efficiency of neural network. (10marks)

5 a. Design a three input network of perceptron to implement XNOR and OR logical gates. (10marks)

b. Explain the importance of dimensionality reduction and effect on accuracy of system. Describe how Principal Component Analysis (PCA) used for dimensionality reduction. (10marks)

6 a. Explain with an example how do we model a multi class classifier in Neural Network. What are the benefits of modeling a multi-class classifier in Neural Network over Logistic regression method. (10marks)

b. Consider the 2-dimensional dataset, (4,8), (5,10), (6,12), (7,14), (8,16). Apply the PCA algorithm and determine the principal components (10marks)

UNIT-III

7 a. Explain how an agent can take action to move from one state to other state with the help of rewards. (10marks)

b. How will you implement the value iteration and the Q Learning algorithm for the following grid problem. (10marks)

S			
	B		
			G

S – start state

B – bad state

G – good state

8 a. Develop a Q-Learning task for recommendation system for a online shopping website. What will be the environment of the system. Write the cost function and value function for the system. (10marks)

b. Explain Markov Decision Process, describe how discount factor plays important role ion the process. (10marks)