Time: 3 Hours   **Max. Marks: 80**

Q.1 Solve any Four

A.   What is Machine Learning? Explain in brief various steps in developing a machine
       learning application?   [05]
B.   Differentiate between supervised and unsupervised learning.   [05]
C.   Draw and explain Biological neuron   [05]
D.   Explain in detail the MP neuron model.   [05]
E.   List various applications of machine learning. And describe the SPAM/
       Non-SPAM email filtering application in detail   [05]

Q.2 Solve the following

A.   Draw a block diagram of the Error Back Propagation Algorithm and explain with the
       flow chart the Error Back Propagation Concept.   [10]
B.   Find a linear regression equation for the following two sets of data: [10]

Time X in (Second)	Mass Y (Grams)
5	40
7	120
12	180
16	210
20	240

Q.3 Solve the following

A.   Diagonalize the matrix A   [05]

$$\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$$

B.   Write short note on Hebbian Learning rule   [05]
C.   What is the curse of dimensionality? Explain PCA dimensionality reduction
        technique in detail.   [10]

4. Solve the following

A. Write a short note on (a) Multivariate regression and (b) Regularized
    Regression.   [10]

B. What are activation functions? Explain Binary, Bipolar, Continuous, and
    Ramp activation functions   [10]

Q. 5 Solve the following

A. Find SVD of matrix A which is shown below   [10]

$$\begin{bmatrix} 1 & 1 \\ 7 & 7 \end{bmatrix}$$

B. Draw Delta Learning Rule (LMS-Widrow Hoff) model and explain it with a training
    process flowchart.   [10]

Q. 6. Write short note on any FOUR

A. Least Square Regression for classification   [05]
B.   Ridge and Lasso Regression   [05]
C. Artificial Neural Networks.   [05]
D. Feature selection methods for dimensionality reduction   [05]
E. Perceptron Neural Network   [05]

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