Duration: 3 hrs **[Max Marks: 80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR **[20]**

a Define Machine Learning. Identify the type of learning required for following cases and justify your answer:
   1. A construction company wants to predict the housing price in next two months.
   2. A software designed to evaluate spam and non-spam mails.

b You trained a model on training dataset and get the below confusion matrix on validation dataset.

N=165	Predicted: NO	Predicted: YES
Actual: NO	50	10
Actual: YES	5	100

Find Accuracy, Precision, F1 score.

c Explain the difference between simple linear regression and multiple linear regression.

d Find the eigenvalues and the eigenvector for the matrix

$$A = \begin{bmatrix} 1 & 2 \\ 5 & 4 \end{bmatrix}$$

e What is the need for dimensionality reduction?

2 a Implement AND function using Perceptron training algorithm **[10]**

b Draw and explain the architecture and algorithm of backpropagation neural networks. **[10]**

3 a Compare and contrast two popular clustering algorithms, such as K-means clustering and hierarchical clustering. Discuss their strengths weaknesses and the scenarios where each algorithm would be most appropriate. **[10]**

b Define Support Vector Machine. Explain how the margin is computed and the optimal hyperplane is decided **[10]**

4 a Compare different types of machine learning methods. **[10]**

b Can we use RBF over XOR function? Demonstrate how you could use RBF networks for solving XOR function. **[10]**

5 a The following table records the number of balls that a player took for scoring runs. In how many balls is he likely to score a century? **[10]**

Runs Scored	8	35	47	54	11	85	84	93	89	2
No. of balls	10	20	31	23	5	47	35	67	73	1

b Explain Principal component analysis algorithm in detail with the help of an example. **[10]**

6 a What is the activation function? Draw and explain different activation functions. **[10]**

b Write a short note on EM algorithm with an example. **[10]**
