Roll No. ..... Total Pages : 03

BT-4/M-23 44227

MATHEMATICS FOR MACHINE LEARNING
BS-CS-AIML-202M

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain the history of Artificial Intelligence. 7.5

   (b) Explain the applications of Data Science in the modern context. 7.5

2. (a) Explain the term Measures of Location. 7.5

   (b) Explain the term Measure of Shape. 7.5

Unit II

3. (a) A bag contains 7 white, 6 red and 5 black balls. Two balls are drawn at random. Find the probability that they will both be white. 7.5

   (b) A problem in mechanics is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. What is the probability that the problem will be solved ? 7.5

4. (a) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	No. of accidents
Mon.	14
Tue.	18
Wed.	12
Thu.	11
Fri.	15
Sat.	14

The tabular value of χ^2 at 5% level for 5 d. f. is 11.09. **7.5**

(b) A sample of 20 items has mean 42 units and standard deviation 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units. The tabulated value of t at 5% level for 19 d. f. is 2.09. **7.5**

Unit III

5. (a) Using the matrix method, show that the equations $3x + 3y + 2z = 1$, $x + 2y = 4$, $10y + 3z = -2$, $2x - 3y - z = 5$ are consistent and hence obtain its solution. **7.5**

(b) Prove that the Eigen values of a Unitary matrix are of unit modulus. **7.5**

6. (a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 7.5

(b) Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence find its inverse by using Cayley-Hamilton theorem. 7.5

Unit IV

7. Diagonalize the matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.. 15

8. Compute the singular value decomposition (SVD) of the matrix $A = \begin{bmatrix} 1 & -1 & 3 \\ 3 & 1 & 1 \end{bmatrix}$. 15