

Roll No.

Total Pages : 04

BT-4/M-24

44226

MATHEMATICS FOR MACHINE LEARNING
BS-CS-AIML

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) What is machine learning ? Discuss the history of machine learning. 7½
(b) What are the three stages of building a model in machine learning ? 7½
2. (a) What are the applications of supervised machine learning in modern businesses ? 7½
(b) Discuss the Data set which are useful for machine learning algorithm. 7½

Unit II

3. (a) There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the time and third

is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads. What is the probability that it was the two headed coin ?

7½

- (b) Five defective bulbs are accidentally mixed with twenty good ones. It is not possible to just look at a bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn at random from this lot.

7½

4. (a) Assume that on the average one telephone number out of fifteen called between 2 P.M and 3 P.M on week days is busy. What is the probability that if 6 randomly selected telephone numbers are called :

(i) not more than three,

(ii) at least three of them will be busy ?

- (b) If the variance of the Poisson distribution is 2, find the probability for $r = 1, 2, 3, 4$ form the recurrence relation of the Poisson distribution.

7½

Unit III

5. (a) Use Gauss Jordan method to find the inverse of the

matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.

7½

- (b) Investigate for consistency of the following equation and hence find the solution $ux - 2y + 6z = 8$, $x + y - 3z = -1$, $15x - 3y + 9z = 21$.

6. (a) Check whether the vectors $\{(1, -2, 5, -3), (0, 7, -9, 2), (0, 0, 1, 0), (0, 0, 0, 1)\}$ are LI or LD. 7½

- (b) Find the eigen value and eigen vector of the given

matrix :
$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$
 7½

Unit IV

7. (a) Which of the following matrix is diagonalizable over and why ? 7½

(i)
$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(ii)
$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

(b) Find an LU decomposition of $\begin{bmatrix} 3 & 1 & 6 \\ -6 & 0 & -16 \\ 0 & 8 & -17 \end{bmatrix}$.

7½

8. Find a singular value decomposition for

$$A = \begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & 0 \end{bmatrix}.$$

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