

# ASSIGNMENT 1 (AIDS-209)

## Probability Statistics & Linear Algebra

1. Two six-sided dice are rolled. What is the probability that the sum of the two numbers is 7, given that at least one of the dice shows a 4?
2. A continuous random variable  $X$  has a pdf  $f(x) = 3x^2$ ,  $0 \leq x \leq 1$ . Find  $a$  and  $b$  such that  
$$P(X \leq a) = P(X > a) \cdot P(X > b) = 0.05.$$
3. Let  $X$  be a random variable with pdf  $f(x) = \begin{cases} \frac{1}{3} e^{-\frac{x}{3}}, & x \geq 1 \\ 0, & \text{otherwise} \end{cases}$ ,  
Find (a).  $P(X > 5)$  (b)  $E(X)$  (c)  $\text{Var}(X)$ .
4. In a distribution, the mean is 60, and the standard deviation is 8. Use Chebyshev's Inequality to estimate the proportion of data that falls within 44 and 76.
5. Three urns are there containing white and black balls; first urn has 3 white and 3 black balls, second urn has 2 white and 3 black balls and third urn has 4 white and 2 black balls. Without any biasing one urn is chosen from that one ball is chosen randomly which was white. What is probability that it came from the third urn?

# ASSIGNMENT 2 (AIDS-209)

## Probability Statistics & Linear Algebra

1. A sortie of 20 aeroplanes is sent on an operational flight. The chances that an aeroplane fails to return is 5%. Find the probability that (i) one plane does not return (ii) at the most 5 planes do not return, and (iii) what is the most probable number of returns?
2.  $X$  is a Poisson variable and it is found that the probability that  $x = 0$  is two-thirds of the probability that  $X = 1$ . Find the probability that  $X = 0$  and the probability that  $X = 3$ . What is the probability that  $X$  exceeds 3.
3. ABC Company has 2,000 accounts receivable. The mean and standard deviation are \$300 and \$50, respectively. Assume that the accounts are normally distributed.
  - a. How many accounts exceed \$400?
  - b. What is the probability that an account selected at random will be between \$200 and \$350?
  - c. Forty percent of the accounts exceed what dollar amount? (Hint: Fifty percent of the accounts are for more than \$300.)
  - d. Twenty percent of the accounts are below what dollar amount?

4. Find the correlation co-efficient for the following data

x	78	89	97	69	59	79	68	57
y	125	137	156	112	107	138	123	108

5. Find the Rank Correlation for the following data:

x	56	42	72	36	63	47	55	49	38
y	147	125	160	118	149	128	150	145	115

# ASSIGNMENT 3 (AIDS-209)

## Probability Statistics & Linear Algebra

1. Given the data points (1, 4), (2, 6), (3, 9), (4, 11), (5, 17) fit a second-degree polynomial. What is the equation of the parabola?

2. Test the hypothesis that the mean of Group A ( $n=25$ ,  $\text{mean}=45$ ,  $s=8$ ) is equal to the mean of Group B ( $n=30$ ,  $\text{mean}=50$ ,  $s=10$ ) using a t-test.

3. Fit a straight line to the following data. Also estimate the value of Y at X=70

x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64

4. Compare the average scores of two different teaching methods: Method A ( $n_1=20$ ,  $\text{mean}=75$ ,  $s_1=10$ ) and Method B ( $n_2=25$ ,  $\text{mean}=80$ ,  $s_2=12$ ). Test the hypothesis that there is no difference in the effectiveness of the two methods.

5. Consider the data set: (1, 2), (2, 5), (3, 10), (4, 17). Fit a polynomial of degree 3.

What is the equation of the curve?

# ASSIGNMENT 4 (AIDS-209)

## Probability Statistics & Linear Algebra

1. Solve the system of linear equations using Cramer's Rule:

$$\begin{aligned}3x + 2y + z &= 7 \\2x - y + 2z &= 2 \\x + 3y - z &= 1\end{aligned}$$

2. Given a matrix  $C = \begin{bmatrix} 4 & 2 \\ 2 & 5 \end{bmatrix}$ , compute the LU-Decomposition of  $C$ .
3. Given a matrix  $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ , compute the Singular Value Decomposition of  $B$ .

4. Determine whether the set of all 2x2 matrices forms a Euclidean vector space. Justify your

5. Assume that

$$u = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \quad v = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \quad w = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$$

Make the set  $\{u, v, w\}$  orthogonal.