

Indian Institute of Technology Jodhpur
Statistical Techniques (MAL7021)

Tutorial 1: Random Variables and their Properties

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- (1) The diameter of a pipe, say X , is assumed to be a continuous random variable. Consider a function $f(x) = 6x(1-x)$, $x \in [0,1]$ and answer the following: (a) $f(x)$ is a PDF, (b) determine b such that $P(X < b) = P(X > b)$, (c) mean, variance, median and mode of X .

- (2) Find the value of a , if random variable X has the PDF

$$f(x) = \begin{cases} ax & x \in [0,1] \\ a & x \in [1,2] \\ -ax + 3a & x \in [2,3] \\ 0 & \text{elsewhere} \end{cases}$$

Also find $P(X \leq 1.5)$ and CDF $F(x)$ of the X .

- (3) Find the second central moment of X which is having symmetrical distribution given by

$$f(x) = \frac{2a}{\pi} \left(\frac{1}{a^2 + x^2} \right), \quad x \in [-a, a].$$

- (4) Let X be a random variable with PDF $f(x)$. Then the mean deviation of X about A is

defined as $MD_X = \int_{R_X} |x - A| f(x) dx$. Show that the mean deviation is least when measured from the mean.

- (5) Verify that the following is a CDF for some random variable X .

$$f(x) = \begin{cases} 0 & x < -a \\ \frac{1}{2} \left(\frac{x}{a} + 1 \right) & x \in [-a, a] \\ 1 & x > a \end{cases}$$

-----Best of Luck-----