

Hindi Vidya Prachar Samiti's
Ramniranjan Jhunhunwala College of Arts, Science and
Commerce(Autonomous)

Programme: MSc. (Statistics)

Part-1

Semester-2

Practical- 2.3.1

Types of Error and Power function

- Q.1 A sample of size 1 is taken from a population distribution $P(\lambda)$. To test $H_0: \lambda = 1$ against $H_1: \lambda = 2$, consider the nonrandomized test $\varphi(x) = 1$ if $x > 3$, and $= 0$ if $x \leq 3$. Find the probabilities of type I and type II errors and the power of the test against $\lambda = 2$. If it is required to achieve a size equal to 0.05, how should one modify the test φ ? Plot the power functions for $H_1: \lambda > 2$.
- Q.2 A sample of size 1 is taken from an exponential PDF with parameter θ , that is, $X \sim G(1, \theta)$. To test $H_0: \theta = 1$ against $H_1: \theta > 1$, the test to be used is the nonrandomized test
- $$\varphi(x) = \begin{cases} 1 & \text{if } x > 2 \\ 0 & \text{if } x \leq 2. \end{cases}$$
- Find the size of the test. What is the power function? Plot the power functions.
- Q.3 Let X_1, X_2 be iid observations from $f(x, \theta) = \frac{1}{\theta} e^{-x/\theta}; 0 < x < \infty, \theta > 0$.
- Consider the acceptance region as $w = \{(x_1, x_2) / x_1 + x_2 < 9.448\}$ for testing $H_0: \theta = 1$ against $H_1: \theta = 5$. Determine type I and II errors.
- Q.4 Let X_1, X_2 be a random sample drawn from $f(x, \theta) = \theta x^{\theta-1}; 0 < x < 1$
- If we test $H_0: \theta = 2$ against $H_1: \theta = 4$ with the critical region $w = \{(x_1, x_2) / x_1 \cdot x_2 \geq 2/3\}$, Find the size and power of the test.
- Q.5 Let the random variable X is distributed as $U(0, \theta)$. We are testing hypothesis $H_0: \theta = 1$ against $H_1: \theta = 2$ based on a single observation. Calculate the type-I-Error and type-II Error based on the following critical regions. Also obtain the power of the test. $A_1 = \{x/x < 0.9\}$, $A_2 = \{x/1 < x < 1.5\}$.

