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(Empowered Autonomous)

Programme: MSc. (Statistics) **Part-1** **Semester-2**

Practical- 2.3.2 **Most Powerful test**

Q.1. Let $X_1, X_2, \ldots X_{10}$ be a random sample from $N(\mu, \sigma^2)$. Find a best test of the hypothesis $H_0 : \mu = 0, \sigma^2 = 1$ against the alternative hypothesis $H_1 : \mu = 1, \sigma^2 = 4$

Data : 0.08, -1.69, -0.27, 2.67, -0.48, 0.52, 1.75,0.75,0.57,0.60.

Q.2. Let $X_1, X_2, \ldots X_n$ be a random sample from a normal distribution with mean μ and variance 100. It is designed to test $H_0 : \mu = 75$ against $H_1 : \mu = 78$. Find test of level of significance 0.05 and with power equal to 0.90 approximately.

Q.3. Let $X_1, X_2, \ldots X_{10}$ be a random sample of size 10 from a $N(0, \sigma^2)$. Find a best critical region of size $\alpha = 0.05$ for testing $H_0 : \sigma^2 = 1$ against $H_1 : \sigma^2 = 2$.
Is this a best critical region against alternative $H_1 : \sigma^2 > 1$.

Q.4. Find the Neyman-Pearson test of size α to test $H_0 : \beta = 1$ against $H_1 : \beta = \beta_1 (> 1)$ based on a sample of size 1 from

$$f(x;\beta) = \begin{cases} \beta x^{\beta-1} & ; \quad 0 < x < 1 \\ 0 & ; \quad otherwise \end{cases}$$

Q.5. Let $X_1, X_2, \ldots X_n$ be a random sample with common pdf

$$f_0(x) = \frac{1}{2\theta} \exp\left(-\frac{|x|}{\theta} \right) ; \; x \in R, \theta > 0$$

Find a size α MP test for testing $H_0 : \theta = \theta_0$ versus $H_1 : \theta = \theta_1 (> \theta_0)$

Q.6.

Let X be an observation in (0,1). Find an MP size α test to test

$$H_0 : X \sim f(x) = 4x \quad \text{if} \quad 0 < x < \frac{1}{2}$$

$$= 4 - 4x \quad \text{if} \quad \frac{1}{2} \le x \le 1$$

against

$$H_1 : X \sim f(x) = 1 \quad if \quad 0 < x < 1.$$

Find the power of your test.

Q.7.

Let $X \sim f_j, j = 0, 1$ where

	x				
	1	2	3	4	5
$f_0(x)$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$f_1(x)$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{6}$

(a) Find the form of the MP test.

(b) Find the size and the power of your test for various values of the cutoff point.

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