



Department: Mathematical Statistics

Academic Year: 2016-2017

Academic Semester: Second

Level: Diploma

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Subject: Statistical Inference II	Subject code: Ms524	Time: 3 Hours	Exam marks: 75	# Exam. Sheets: 1
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Examiner : Dr. Hiba Zeyada

Question One:

a) Neyman –Pearson lemma states that:

" If C is a critical region of size α and K is a constant such that $\frac{L_0}{L_1} \leq K$ inside C and $\frac{L_0}{L_1} \geq K$ outside C, then C is the most powerful critical region for testing $\theta = \theta_0$ against $\theta = \theta_1$ ". **Prove the above lemma**

b) Given a random sample of size $n=20$ from $N(\mu, 5)$ use Neyman –Pearson lemma to find the MPT of size $\alpha = 0.05$ to test $H_0: \mu = 7$ versus $H_1: \mu > 7$.

Question Two:

a) Suppose we wish to test $H_0: \mu = 15$ versus $H_1: \mu = 16$

with $\alpha = \beta = 0.05$. Find the sample size that will ensure this accuracy assume $\sigma^2 = 9$.

b) Given a random sample of size n from a normal distribution with mean μ (unknown) and variance σ^2 . For testing $H_0: \sigma^2 = \sigma_0^2$ versus $H_1: \sigma^2 > \sigma_0^2$, show that the likelihood ratio test is equivalent to the chi- square test.

Question Three: True or false? Correct the false

- 1- The random variable $\frac{(n-1)S^2}{\sigma^2}$ is distributed as chi-square with $n-1$ degrees of freedom
- 2- The p-value of a test is the largest value of α that would lead to accept the alternative hypothesis.
- 3- The random variable $\frac{\bar{X}-\mu}{S/\sqrt{n}}$ is standard normal distributed.
- 4- The power function is the probability to accept the null hypothesis
- 5- If X is a continuous random variable then the distribution of $F_X(x)$ is **uniform** with parameters **a** and **b**
- 6- A type I error is made if H_0 is rejected when H_1 is true
- 7- A Test is MPT of size α if it has the size of its type I error equal to α and has smallest type II error among all other tests with size of type I error α or less.

Hint: use $Z_{0.05} = 1.64$