



LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – NOVEMBER 2024

UST 5504 – TESTING OF HYPOTHESES



Date: 18-11-2024

Dept. No.

Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A - K1 (CO1)

	Answer ALL the Questions	(10 x 1 = 10)
1.	Define the following	
a)	Critical region.	
b)	Uniformly most powerful critical region.	
c)	Parameter space.	
d)	Test statistic for testing difference between two proportions.	
e)	Non - parametric tests.	
2.	Fill in the blanks	
a)	The probability of Type I error is _____.	
b)	The most powerful critical region is obtain using _____ lemma.	
c)	Under certain assumptions, Likelihood Ratio test is _____.	
d)	F test statistic = _____ if $S_1^2 \geq S_2^2$	
e)	A _____ is defined as a sequence of letters of any kind surrounded by a sequence of letters of other kinds.	

SECTION A - K2 (CO1)

	Answer ALL the Questions	(10 x 1 = 10)
3.	Match the following	
a)	Alternative Hypothesis	1. Variance Ratio
b)	Simple against simple	2. Test for randomness
c)	α is controlled	3. $H_1: \mu(\bar{x} \vee \bar{y}) \mu_0$
d)	F test	4. UMP Critical Region
e)	Run Test	5. Likelihood Ratio Test
4.	True or False	
a)	Accepting H_0 when it is false is Type I error.	
b)	Most powerful critical region may be defined by marginal distribution.	
c)	$-2 \log_e \lambda$ is asymptotic normal distribution.	
d)	Paired t - test is used for dependent samples.	
e)	In non - parametric tests, no assumption is made about parent population.	

SECTION B - K3 (CO2)

	Answer any TWO of the following in 100 words each.	(2 x 10 = 20)
5.	Let X have a p.d.f of the form $f(x, \theta) = \frac{1}{\theta} e^{\frac{-x}{\theta}}$; $-\infty < x < \infty, \theta > 0$, to test $H_0: \theta = 2$ against $H_1: \theta = 1$, use the random sample x_1, x_2 of size 2 and define a critical region: $W: \{(x_1, x_2); 0.95 \leq x_1 + x_2\}$ Find (i) Power of the test (ii) Significant Level of the test.	
6.	Prove that the power function of testing the mean θ of a normal distribution with known σ^2 is	

	monotonically increasing function of $\hat{\tau}$).
7.	Explain the steps involved in one sample t-test for testing $H_0: \mu = \mu_0$ vs $H_1: \mu \neq \mu_0$.
8.	Explain the procedure of run test.

SECTION C – K4 (CO3)

Answer any TWO of the following in 100 words each.

(2 x 10 = 20)

9.	Show that for the normal distribution with mean 0 and variance σ^2 , the best critical region for $H_0: \sigma = \sigma_0$ against $H_1: \sigma = \sigma_1$ of the form: $\sum_{i=1}^n x_i^2 \leq a_\alpha$ for $\sigma_0 > \sigma_1$ and $\sum_{i=1}^n x_i^2 \geq b_\alpha$ $\vee$ $\sigma_0 < \sigma_1$.
10.	Explain the concept of SPRT.
11.	A certain stimulus administered to each of the 12 patients resulted in the following of Blood Pressure: 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4 and 6. Can it be concluded that the stimulus, in general, be accompanied by an increase in /blood Pressure?
12.	Discuss the advantages and drawbacks of non - parametric methods over parametric methods.

SECTION D – K5 (CO4)

Answer any ONE of the following in 250 words

(1 x 20 = 20)

13.	State and prove Neyman Pearson Lemma.
14.	Obtain Likelihood Ratio test for equality of variances of two normal populations.

SECTION E – K6 (CO5)

Answer any ONE of the following in 250 words

(1 x 20 = 20)

15.	Construct SPRT for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1 (\neq \theta_0)$ in sampling from normal density; $f(x, \theta) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{x - \mu}{\sigma} \right)^2}; -\infty < x < \infty$
16.	a) Explain the steps involved in sign test. (b) Explain Mann - Whitney - U - Test.

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