This question paper contains 3 printed pages]

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S. No. of Question Paper	: 7133		
Unique Paper Code	: 2371601		
Name of the Paper	: Statistical Inference II		
Name of the Course	: ERSTWHILE FYUP B.Sc. (H) Statistics		
Semester	: VI		

Duration : Three Hours

1. 1.

Maximum Marks: 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any five questions.

1. (a) What is a statistical hypothesis ? Define :

- (i) Two types of errors,
- (ii) Power of a test,
- (iii) Simple and composite hypotheses, with illustrations.
- (b) In a Bernoulli distribution with parameter p, $H_0 : p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$ is rejected, if more than 4 heads are obtained out of 6 throws of a coin. Find the probabilities of type I and type II errors and the power of the test.
- (c) Let X_1, X_2, \dots, X_n be a random sample from discrete distribution with probability function f(x) for which X takes non-negative integral values 0, 1 2,

Under H_0 : $f(x) = \begin{cases} \frac{e^{-1}}{x!}, & x = 0, 1, 2, \dots, \\ 0, & \text{otherwise} \end{cases}$

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and under H_1 : $f(x) = \begin{cases} \frac{1}{2^{x+1}}; & x = 0, 1, 2, \dots, \\ 0, & \text{otherwise} \end{cases}$

2.

4.

Obtain the best critical region of size α for testing H₀ against H₁ for sample of size *n* and a positive number *k*. Hence, obtain the power of the test for the case n = 1 and k = 1. 5.5,5

- (a) Explain the concept of most powerful test. State and prove the theorem used to determine the best critical region for testing a simple null hypothesis against a simple alternative hypothesis.
 - (b) Given a random sample X_1, X_2, \dots, X_n of size *n* from the distribution with p.d.f. $f(x, \theta) = \theta e^{-\theta x}; x > 0, 0 < \theta < \infty.$

Show that UMP test for testing $H_0: \theta = \theta_0$ against $H_1: \theta < \theta_0$ is given by

 $\left\{x \mid \sum x_{i} \geq \frac{1}{2\theta_{0}} \chi^{2}_{\alpha, 2n}\right\}, \text{ where } \chi^{2}_{\alpha, 2n} \text{ is the upper } \alpha \text{-point of the } \chi^{2} \text{ distribution}$

with 2n degrees of freedom. Also, obtain the power function of the test. 10.5
Construct likelihood ratio test for testing H₀: μ = μ₀ against various alternatives in case of a random sample of size n drawn from a normal population with mean μ and known variance σ².

Describe Wald's S.P.R.T. and its O.C. and A.S.N. functions.

Construct S.P.R.T. for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1(0 < \theta_0 < \theta_1)$ on the basis of a random sample drawn from Pareto distribution with density function $f(x, \theta) = \frac{\theta a^{\theta}}{x^{\theta+1}}, x \ge a$. Also obtain its O.C. and A.S.N. functions.

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- (a) If S.P.R.T. of strength (α , β) terminates with probability one, then determine its stopping bounds.
- (b) Discuss advantages and disadvantages of non-parametric tests over parametric tests. Describe the Mann-Whitney-Wilcoxon test for testing whether the two given samples are drawn from the same continuous population. 5,10
- 6. Develop the Wald-Wolfowitz run test for testing the quality of two distribution functions. Also discuss the case of ties.
 - 7. (a) Define an UMP critical region. Show that an UMP critical region is necessarily unbiased.

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- (b) Write short notes on any two of the following :
 - (i) Median test,
 - (ii) One sample runs test for randomness.
 - (iii) Paired sample sign test.

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