2021

STATISTICS— GENERAL

Paper : GE/CC-3

(Introduction to Statistical Inference)

Full Marks : 50

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.

1. Answer *any five* questions: 2×5

   (a) If X_1, X_2, X_3 are *i. i. d.* $N(0,1)$ variates, write down the p.d.f of $T = \dfrac{\sqrt{2}X_1}{\sqrt{X_2^2+X_3^2}}$

   (b) Distinguish between estimator and estimate.

   (c) In a Bernoulli distribution with parameter p, $H_0: p = \frac{1}{3}$ is rejected if more than 3 heads are obtained out of 5 throws of a coin. Find the probability of Type I error.

   (d) For a one-way ANOVA, find an unbiased estimator of the error variance.

   (e) Let $(X_1, X_2, ..., X_n)$ be a random sample from $N(\mu, 1)$ population. Find the maximum likelihood estimate of μ.

   (f) Write one disadvantage of a CRD.

   (g) What is a BLUE?

   (h) Define power of a test.

2. Answer *any two* questions: 5×2

   (a) If X_1 and X_2 are independently distributed Poisson random variables with parameters λ_1 and λ_2 respectively, obtain the distribution of $X_1 + X_2$.

   (b) If $(X_1, X_2, ..., X_n)$ is a random sample from normal population $N(\theta, 1)$, show that $\bar{X}^2 - \frac{1}{n}$ is an unbiased estimator of θ^2.

   (c) Derive the distribution of the different sums of squares involved in a one-way classified data.

3. Answer *any three* questions: 10×3

   (a) Suppose $(X_1, X_2, ..., X_n)$ be a random sample from $N(\mu, \sigma^2)$ distribution. Derive the maximum likelihood estimators of μ and σ^2. Also examine the consistency of the sample mean as an estimator of μ. 6+4

   (b) Describe a suitable test for testing $H_0 : \mu_1 = \mu_2$ against all possible alternatives for two independent normal populations $N(\mu_1, 3^2)$ and $N(\mu_2, 4^2)$. Also find a 95% confidence interval for $\mu_1 - \mu_2$. 10

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(c) If X_1, X_2, X_3, X_4 are independent random variables each distributed as normal with zero mean and variance 4. Find the distributions of   5+5

   (i) $X_1 + X_2$

   (ii) $\dfrac{X_1^2 + X_4^2}{X_2^2 + X_3^2}$

(d) Briefly describe the analysis of variance technique for analyzing a two-way classified data with only one observation in each cell. Clearly state all the assumptions.   10

(e)   (i) Discuss any one of the basic principles of design of experiment.

      (ii) Give the layout of an RBD.   5+5

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