63/1 (SEM-3) (GE3/DSC)
STSHG/RC3036

2023

STATISTICS

Paper : STSHG3036/STSRC3036

(Statistical Inference)

Full Marks : 60

Pass Marks : 24

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct option from the following (any *five*) : 1×5=5

(a) Estimate and estimator are

(i) synonyms

(ii) different

(iii) related to the population

(iv) All of the above

(b) Let $\hat{\theta}$ be the estimator for the parameter θ. Then $\hat{\theta}$ is said to be unbiased for θ if

(i) $E(\hat{\theta}) = n\theta$

(ii) $E(\hat{\theta}) = \theta$

(iii) $E(\hat{\theta}) = \theta^2$

(iv) $E(\hat{\theta}) = \hat{\theta}$

(c) A hypothesis may be classified as

(i) simple

(ii) composite

(iii) null

(iv) All of the above

(d) Area of the critical region depends on

(i) size of type I error

(ii) size of type II error

(iii) value of the statistics

(iv) number of observations

(e) Non-parametric methods are based on

(i) mild assumption

(ii) stringent assumption

(iii) no assumption

(iv) Both *(i)* and *(iii)*

(f) Ordinary sign test is used in

(i) Poisson distribution

(ii) binomial distribution

(iii) Both *(i)* and *(ii)*

(iv) Neither *(i)* nor *(ii)*

(g) If there are zero differences in sign test, they may be

(i) discarded

(ii) treated half of them as positive

(iii) treated half of them as negative

(iv) All of the above

(h) The probability of hyppothesis rejecting H_0 when it is actually true is

(i) type I error

(ii) type II error

(iii) critical regions

(iv) Both (i) and (ii)

(i) Let T_1 and T_2 be two statistics such that $P(T_1 > \theta) = \alpha_1$, $P(T_2 < \theta) = \alpha_2$, where $\alpha_1 + \alpha_2 = \alpha$ then

(i) $P(T_1 < \theta < T_2) = 1 - \alpha$

(ii) $P(T_1 < \theta < T_2) = 1 - \alpha^2$

(iii) $P(T_1 < \theta < T_2) = 1 + \alpha$

(iv) $P(T_1 < \theta < T_2) = 1 + \alpha^2$

(j) If n_1 and n_2 in Mann-Whitny test are large, the variable v is distributed with mean

(i) $\frac{n_2 + n_2}{2}$

(ii) $\frac{n_1 - n_2}{2}$

(iii) $\frac{n_1 n_2}{2}$

(iv) $n_1 n_2$

(Continued)

2. Answer any *five* from the following : 2×5=10

(a) Write down the difference between null and alternative hypotheses.

(b) Define the Cramer-Rao inequality.

(c) What are the characteristics of a good estimator?

(d) What is power of a test?

(e) Mention two advantages of non-parametric methods.

(f) When do you call a test uniformly most powerful (UMP) test?

(g) A random sample $(x_1, x_2, x_3, x_4, x_5)$ of size 5 is drawn from a normal population with mean μ, then prove that $E(t) = \mu$, where

$$t = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$$

3. Answer any *five* from the following : 5×5=25

(a) Explain the steps in solving test of hypothesis.

(b) If x is a Poisson variate with parameter λ, find maximum likelihood estimate (MLE) of λ.

(Turn Over)

(c) Define efficiency of an estimator. Let $x_1 x_2 \cdots x_n$ is a random sample from a normal population N(μ, 1). Show that

$$t = \frac{1}{n}\sum_{i=1}^{n} x_i^2$$

is an unbiased estimator of $\mu^2 + 1$.

(d) Define level of significance and critical region.

(e) Write a short note on test for randomness.

(f) What are the basic steps involved in any non-parametric test of hypothesis?

(g) Distinguish between non-parametric and parametric tests.

(h) Distinguish between type I and type II errors.

(i) Discuss the method of moments for estimating the parameters.

4. Answer any *two* from the following : 10×2=20

(a) Discuss the method of least square estimation.

(b) Describe Wald-Wolfowitz run test for identicalness of two populations.

(c) Define minimum variance unbiased estimator. Show that a minimum variance unbiased is unique in the sense that if T_1 and T_2 are minimum variance unbiased estimators for $\gamma(\theta)$, then $T_1 = T_2$, almost surely.

(d) Define the following :

(i) Point estimation

(ii) Statistical hypothesis

(iii) Sample space

(iv) Neyman-Pearson lemma

(iv) Rao-Blackwell theorem

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