



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2020

STSACOR08T-STATISTICS (CC8)

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

Answer any four from the following questions

5×4 = 20

1. Describe why unbiased estimators are preferred for estimating a parametric function. For Poisson(θ) population, find two distinct unbiased estimators of $e^{-2\theta}$ on the basis of a random sample of size n . 2+3
2. Discuss the concept of sufficiency. For a random sample $\{X_1, X_2, \dots, X_n\}$ from Bernoulli (θ) population, check whether $T = \sum_{i=1}^n X_i^4$ is sufficient or not. 3+2
3. Let U be the class of all unbiased estimators of $g(\theta)$ with finite variances and U_0 be the class of all unbiased estimators of zero with finite variances. Show that $T \in U$ is the UMVUE of $g(\theta)$ iff for every $e \in U_0$ $\text{cov}_\theta(T, e) = 0 \forall \theta$. 5
4. What do you mean by a test function? On the basis of a single observation from Bin($4, \pi$) construct a test of exact size 0.01 for the testing problem $H_0: \pi = \frac{1}{2}$ v.s. $H_1: \pi > \frac{1}{2}$. 2+3
5. State Fundamental Neyman-Pearson Lemma. On the basis of a random sample of size n from $\mathcal{N}(\theta, \theta)$ population with $\theta > 0$, show that for some $c > 0$, $\omega = \{x: \sum_{i=1}^n x_i^2 > c\}$ is the critical region of MP-test for testing $H_0: \theta = 1$ v.s. $H_1: \theta = 4$. 2+3
6. Discuss the concept of likelihood ratio test. State the properties of likelihood ratio test. 3+2

GROUP-B**Answer any two from the following questions**

10×2=20

7. Define complete sufficient statistic. Show that all the sufficient statistics are not complete. Discuss the utility of complete sufficient statistic in finding best estimator through an example. 1+4+5
8. What is UMP test of size α ? For a sample of size n from exponential distribution with parameter θ , find UMP test of size α for testing $H_0: \theta = \theta_0$ vs. $H_1: \theta > \theta_0$. Find the power function of the test and hence show that the test is consistent. 2+5+(2+1)
9. (a) Distinguish between fixed sample size approach and sequential approach in view of testing of statistical hypothesis. 4+(3+3)
- (b) For $\mathcal{N}(\mu, \sigma_0^2)$ population (where σ_0 is known quantity), derive sequential test procedure for the testing problem $H_0: \mu = \mu_0$ vs. $H_1: \mu = \mu_1 (> \mu_0)$. Also find the OC function and ASN.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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