1105E198 Candidate's Seat No : ________

BSc Sem 5 Examination

CC - 301

Statistics

Time : 2-00 Hours] **May 2022** **[Max. Marks : 50**

All the question in section I carry equal marks.
Attempt **any three** questions from section I.
Section II is compulsory.

Section-I

1. (A) Define Consistency. State and prove the sufficient condition for consistency.
   (B) State and prove Rao-Cramer Inequality for the variance of an unbiased estimator.

2. (A) Explain the concept of Unbiasedness. For any distribution, show that sample mean is an unbiased estimator of the population mean.
   (B) Let $X_1, X_2, \cdots, X_n$ be a random sample of size n from $N(0, \sigma^2)$ distribution. Let $s^2 = \frac{1}{n}\sum_{i=1}^{n}(X_i - \overline{X})^2$ be the sample variance. Show the sample variance is consistence estimator of σ^2.

3. (A) Let $X_1, X_2, \cdots, X_n$ be a random sample of size n from $U(\theta, \theta+1)$ distribution. Show that the sample mean is both unbiased and consistent estimator of $\theta + \frac{1}{2}$.
   (B) Let $X_1, X_2, \cdots, X_n$ be a random sample from $N(\mu, \sigma^2)$ distribution. Let $s^2 = \frac{1}{n}\sum_{i=1}^{n}(X_i - \overline{X})^2$ be the sample variance. Obtain the efficiency of $\frac{ns^2}{n-1}$.

4. (A) Explain the method of Moment estimation.
   (B) Let $X_1, X_2, \cdots, X_n$ be a random sample from $U(0, \theta)$ distribution. Obtain maximum likelihood estimator of θ.

5. (A) Explain the method of maximum likelihood.
   (B) Let $X_1, X_2, \cdots, X_k$ be a random sample of size k from a $NB(r, p)$ distribution. Obtain method of moment estimator of r and p.

6. (A) State and prove the factorization theorem on sufficiency (Discrete case).
   (B) From efficiency point of view compare sample mean and sample median as estimator of parameter μ of $N(\mu, \sigma^2)$ distribution.

7. (A) Define MVUE. Show that MVUE is unique.
   (B) Let $X_1, X_2, \cdots, X_n$ be a random sample from Bernoulli distribution with parameter p. Show that $T = \sum_{i=1}^{n} X_i$ is a sufficient estimator of p.

8. (A) Obtain $100(1-\alpha)\%$ confidence interval for the variance of normal distribution when its mean is unknown.
   (B) Obtain $100(1-\alpha))\%$ confidence interval for the population proportion in binomial distribution.

Section-II

E 198-2

B.Sc. Semester V (Statistics STA-301 (New))
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9. Select the correct answer:

(i) If an expected value of an estimator is not equal to the parameter, then it is said to be

A. Unbiased estimator B. Biased estimator C. Consistent estimator D. Efficient estimator

(ii) If an estimator T_n of population parameter θ converges in probability to θ as $n \to \infty$ then it is

A. Unbiased estimator B. Efficient estimator C. Biased estimator D. Consistent estimator

(iii) The denominator of Rao-Cramer inequality is called

A. Upper bound of the variance

B. Lower bound of the variance

C. Fisher's information function

D. None of the above

(iv) If an estimator is MVBUE then

A. Rao-Cramer Lower bound $<$ actual variance

B. Rao-Cramer Lower bound $>$ actual variance

C. Rao-Cramer Lower bound $=$ actual variance

D. Cannot say surely

(v) In finding the confidence interval, the quantity $1 - \alpha$ is called

A. Level of significance

B. Width of the confidence interval

C. Confidence coefficient

D. None of these

(vi) The formula for the confidence interval for the variance of normal population involve

A. t distribution B. χ^2 distribution C. F distribution D. Z distribution

(vii) Consistency of an estimator is

A. Large sample property

B. Small sample property

C. not related to sample size

D. related to any sample size

(viii) For fixed confidence coefficient, the most preferred confidence interval for the parameter θ is one

A. with largest width B. shortest width C. with an average width D. none of these

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End of Paper.