

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2022
(Fourth Semester)
Branch – STATISTICS

STATISTICAL INFERENCE -I

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions
ALL questions carry EQUAL marks

(10 x 1 = 10)

1. Estimate and estimator are
(i) Synonyms (ii) different
(iii) related to population (iv) none of the above
2. The estimator $\sum \frac{x}{n}$ of population mean is
(i) an unbiased estimator (ii) a consistent estimator
(iii) both (iv) and (ii) (iv) neither (i) nor (ii)
3. Factorisation theorem for sufficiency is known as
(i) Rao-Blackwell theorem (ii) Crammer-Rao theorem
(iii) Chapman Rabins theorem (iv) Fisher-Neyman theorem
4. Bias of an estimator can be
(i) positive (ii) negative
(iii) either positive or negative (iv) always zero
5. The credit of inventing the method of moments for estimating the parameters goes to
(i) R.A.Fisher (ii) J.Neyman
(iii) Laplace (iv) Karl Pearson
6. Minimum chi square estimators are
(i) consistent (ii) asymptotically normal
(iii) efficient (iv) All the above
7. Formula for confidence interval for the ratio of two normal population involves
(i) chi-square distribution (ii) F-distribution
(iii) t- distribution (iv) none of the above
8. A confidence interval of confidence coefficient (1- α) is best which
(i) smallest width
(ii) vastest width
(iii) upper and lower limits equidistant from the parameter
(iv) one sided confidence interval
9. Wilcoxon's signed rank test considers the differences ($X_i - M_0$) by way of
(i) signs only (ii) magnitudes only
(iii) signs and magnitudes both (iv) All the above
10. Mann-Whitney test statistic U depends on the fact that
(i) how many times Y's precede X's (ii) how many times X's precede Y's
(iii) both (iv) and (ii) (iv) none of the above

Cont...

SECTION - B (35 Marks)Answer **ALL** Questions**ALL** Questions Carry **EQUAL** Marks (5 x 7 = 35)

- 11 a State and prove that invariance property of consistent estimators.
OR
- b If $X_1, X_2, X_3, \dots, X_n$ are random observations on a Bernoulli variate X taking the value 1 with probability p and the value 0 with probability $(1 - p)$, prove that $\frac{\sum x_i}{n} \left(1 - \frac{\sum x_i}{n}\right)$ is a consistent estimator of $p(1 - p)$.
- 12 a Let $X_1, X_2, X_3, \dots, X_n$ be a random sample from a uniform population on $[0, \theta]$. Find sufficient estimator for θ .
OR
- b Let $X_1, X_2, X_3, \dots, X_n$ be a random sample from uniform $U [0, \theta]$ $\theta > 0$ population. Show that $T = \max_{1 \leq i \leq n} (x_i) = x_{(n)}$ is a complete sufficient statistics for θ .
- 13 a Write the properties of Maximum Likelihood Estimators.
OR
- b Describe the method of moments for estimators.
- 14 a Discuss the confidence limits and confidence intervals.
OR
- b Given one observation from a population with p.d.f $f(x, \theta) = \frac{2}{\theta^2}(\theta - x), 0 \leq x \leq \theta$, Obtain $100(1-\alpha)\%$ confidence intervals for θ .
- 15 a Describe the procedure of run test.
OR
- b Describe the procedure of median test.

SECTION - C (30 Marks)Answer any **THREE** Questions**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 State and prove that Cramer-Rao inequality.
- 17 State and prove that Rao-Blackwell theorem.
- 18 Describe the modified minimum chi-square method.
- 19 Obtain $100(1-\alpha)\%$ confidence intervals for the parameter ((i) θ and (b) σ^2 , of normal distribution;

$$f(x, \theta; \sigma) = \frac{1}{\sigma\sqrt{2\pi}} \exp \left\{ -\frac{1}{2} \left(\frac{x - \theta}{\sigma} \right)^2 \right\}, -\infty \leq x \leq \infty$$

- 20 Write briefly the procedure of sign test and give its advantages.

Z-Z-Z

END