

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(Fourth Semester)

Branch – MATHEMATICS

MATHEMATICAL STATISTICS-II

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

1. If $x_1, x_2, \dots, x_n$ be a random sample from an $N(\mu, \sigma^2)$ population, the sufficient statistics for μ is _____.

(a) $\Sigma(X_i - \bar{x})$

(b) $\frac{\bar{x}}{n}$

(c) $\Sigma(X_i \mu)^2$

(d) none of the above

2. If $X_1, X_2, \dots, X_n$ is a random sample from a population $\frac{1}{\theta\sqrt{2\pi}}e^{-x^2/2\theta^2}$, the maximum likelihood for θ is _____

(a) $\sqrt{\frac{\Sigma X_i^2}{n}}$

(b) $\frac{\Sigma X_i^2}{n}$

(c) $\sqrt{\frac{\Sigma_i X_i^2}{n}}$

(d) $\frac{\Sigma X_i}{n}$

3. A hypothesis which defines the population distribution is called?

(a) Null Hypothesis

(b) Statistical Hypothesis

(c) Simple Hypothesis

(d) Composite Hypothesis

4. The range of Level of Significance lies between _____

(a) $-\infty$ and 0

(b) $-\infty$ and ∞

(c) 0 and ∞

(d) 0 and 1

5. The purpose of blocking in RBD _____

(a) To reduce instrument error

(b) To increase treatment variability.

(c) To avoid randomization.

(d) To simply data analysis.

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 3 = 15)

6. (a) Find the uniformly minimum variance unbiased estimator for $e^{-\theta}$ based on a random sample drawn from the Poisson (θ) distribution.

(OR)

(b) Write a short note on Consistency.

7. (a) Let $X_1, X_2, \dots, X_n$ is a random sample from $N(\theta, 1)$. Obtain minimum variance of unbiased estimator of θ .

(OR)

(b) Give a brief note on minimum variance with examples.

8. (a) Write a short note on Statistical hypothesis.

(OR)

(b) Elucidate the concept of power of test.

Cont....

9. (a) Twenty people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease is 85% in favor of the hypothesis that it is more at 5% level?

(OR)

- (b) Find the least value of r in a sample of 18 pairs of observations from a bi-variate normal population, significant at 5% level of significance.
10. (a) Write a short note on complete and incomplete block designs.

(OR)

- (b) Describe the procedure for complete randomized design.

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 6 = 30)

11. (a) State and prove Rao-Blackwell theorem.

(OR)

- b) Derive the Cramer-Rao inequality.

12. (a) State the properties of methods of moments.

(OR)

- (b) Let $X_1, X_2, \dots, X_n$ are a random sample from the uniform distribution with probability

density function is $f(x, \theta) = \begin{cases} \frac{1}{\theta} & 0 < x < \theta, \theta > 0 \\ 0 & \text{elsewhere} \end{cases}$. Obtain the maximum likelihood estimator for θ .

13. (a) Elucidate the types of error with examples.

(OR)

- (b) Explain the types of hypothesis with its applications.

14. (a) Obtain the equation of the normal curve that may be fitted to the following data.

Class : 60-65 65-70 70-75 75-80 80-85 85-90 90-95 95-100

Frequency: 3 21 150 335 326 135 26 4

Obtain the expected normal frequencies and test the goodness of fit

(OR)

- (b) What is contingency table? Describe how the chi-square distribution may be used to test whether the two criteria of classification in an $m \times n$ contingency table are independent.

15. (a) Illustrate the procedure of missing plot technique for RBD.

(OR)

- (b) Explain the principles of experimental design.

Z-Z-Z

END