22MAU413

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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. State whether, Rao-Blackwell theorem enables us to obtain minimum variance unbiased estimator through _____.
   (a) Unbiased estimators (b) sufficient statistics
   (c) Efficiency statistics (d) complete statistics

2. When estimating the parameter of a linear function, most commonly used method of estimation is _____.
   (a) Maximum likelihood estimation (b) least square method
   (c) Method of minimum Chi-square (d) method of moments

3. Which of the following is used to quantify the level of uncertainty about the sample mean to test the significance of the population mean?
   (a) Confidence Interval (b) Hypothesis test
   (c) z-score (d) standard deviation

4. Identify in the Pearson correlation coefficient ranges in between the strength and direction of a linear relationship between two variables?
   (a) -1 and 0 (b) 0 and 1
   (c) -1 and 1 (d) 0 and 100

5. Find out in a Randomized Block Design (RBD)_____.
   (a) Blocks are used to control for the effects of extraneous variables
   (b) Blocks are the experimental units
   (c) There is no randomization involved
   (d) Each treatment is applied to every block

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6. (a) Bring out the sufficient statistic for θ based on a random sample drawn from the Exponential distribution. Verify whether it is also a minimal sufficient.
   (OR)
   (b) Narrate a short note on parametric estimation.

7. (a) Develop a brief note on maximum likelihood estimation.
   (OR)
   (b) Show the estimators of α and β using a random sample drawn from the Beta (α, β) distribution applying the method of moments.

Cont ...

8. (a) Outline a short note on power of test.

(OR)

(b) Classify null hypothesis and alternative hypothesis. How statistical hypothesis are tested?

9. (a) Solve when Twenty people were attacked by a disease and only 18 were survived. How will you reject the hypothesis that the survival rate, of attacked by this disease is 85% in favour of the hypothesis . Check 5% level?

(OR)

(b) Develop a short note on correlation with suitable examples.

10. (a) Describe completely randomized design.

(OR)

(b) Sketch out the basic concept of design of experiments.

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) Point out the properties of maximum likelihood estimators.

(OR)

(b) Examine, In random sampling from normal population N (μ, σ^2), find the maximum likelihood estimators of (i) μ when σ^2 is known (ii) σ^2 when μ is known (iii) The simultaneous estimation of μ and σ^2.

13. (a) Elucidate the concept of testing of hypothesis with examples.

(OR)

(b) Discuss the various types of errors with its applications.

14. (a) Point out 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) Examine the chi-square test of significance and state various uses.

15. (a) Identify the missing plot technique for RBD and LSD.

(OR)

(b) Justify the procedure for Latin square design and its uses.

Z-Z-Z END