



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – MATHEMATICS

FOURTHSEMESTER – APRIL 2018

16UST4AL01- MATHEMATICAL STATISTICS

Date: 25-04-2018
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION - A

Answer all the questions.

(10 X 2 = 20)

1. Define unbiased estimator.
2. Write any two properties of ML estimators.
3. Define Efficient Estimator.
4. Define confidence interval
5. Define (i) Level of significance (ii) Power of the test.
6. Which tests of hypothesis are called two-tailed tests and give a suitable example for it.
7. Mention any two applications of t-distribution in test of significance?
8. Write the test statistic for testing the difference between two population variances.
9. State the principles of least squares.
10. What is the need for sampling methods?

SECTION- B

Answer any five questions.

(5 X 8 = 40)

11. a) Show that the sample mean is an unbiased estimator of the population mean.
b) Explain the concept of consistent estimator and also show that in sampling from a $N(\mu, \sigma^2)$ population, the sample mean is a consistent estimator of μ .
12. State and prove Rao-Blackwell theorem.
13. The height of 10 males of a given locality are found to be 70,67,62,68,61,68,70,64,64,66 inches. Find 95 % confidence interval for Population Mean.
14. Let x_1, x_2, \dots, x_n be a random sample from Bernoulli distribution. Obtain the Best Critical Region for testing $H_0: p = \frac{1}{2}$ Vs $H_1: p = \frac{1}{3}$
15. Describe the steps involved in testing of statistical hypothesis.

16. Below are given the gain in weights (in kgs) of pigs fed on two diets A and B

Diet A	25	32	30	34	24	14	32	24	30	31	35	25			
Diet B	44	34	22	10	47	31	40	30	32	35	18	21	35	29	22

Test, if the two diets differ significantly as regards their effect on increase in mean weight.

17. The result of a certain survey shows that out of 50 ordinary shops of small size, 35 are managed by men of which 17 are in cities, 12 shops in villages are run by women. Can it be inferred that shops run by women are relatively more in villages than in cities.

18. Explain in detail various Sampling Methods.

SECTION- C

Answer any two questions.

(2 X 20 = 40)

19. a) Describe the procedure of Maximum Likelihood Estimation.

b) In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators (MLE) for i) μ when σ^2 is known ii) σ^2 when μ is known

20. i) State and prove Cramer-Rao Inequality (12)

ii) Find $100(1 - \alpha)$ % confidence intervals for the parameter μ when σ^2 is unknown in the normal distribution. (8)

21. i) State and prove Neyman – Pearson Lemma. (10)

ii) Explain Monotone Likelihood ratio property. Find whether the family $N(\mu, 1)$ satisfied this property. (10)

22. i) The following table gives the yields of 15 samples of plot under three varieties of seed:

A	B	C
20	18	25
21	20	28
23	17	22
16	15	28
20	25	32

Test using analysis of variance whether there is a significant difference in the average yield of seeds. (12)

ii) Derive the least square estimators of the Regression coefficients in a simple linear regression model? (8)
