

Statistical Methods

Time : 3 Hours]

[Max. Marks : 40

Note : Attempt all five questions. Each question carries equal marks.

- (a) When is an estimator said to be (i) consistent (b) efficient ?
Explain with one example of each.
- (b) What is a maximum likelihood estimator ? State various properties of maximum likelihood estimators.

OR

Write short notes on Cramer Rao inequality and Minimum variance estimators.

- Explain with an example, the problem of "test of statistical hypothesis". When is a hypothesis said to be (a) simple, (b) composite. Give one example of each. What is the role of critical region in Neyman Pearson test ? What happens to probability of type I error as power of the test increases ? Why?

OR

Use the Neyman-Pearson lemma to obtain the Best critical regions for testing $\theta_1 = \theta_0$ against $\theta = \theta_1 > \theta_0$ and $\theta = \theta_1 < \theta_0$ on the basis of a random sample of size n from $N(\theta, \sigma^2)$ distribution when σ^2 is known.

- Define Beta distribution of second kind and obtain its mean and variance.

OR

- (a) Define t and P distributions.
- (b) It is believed that the variance of measurements taken by an instrument is no more than 0.16" and it is known that the measurements follow a normal distribution. Test if the belief about variance is true, given that 11 measurements of the same unit by the instrument gave the following results :

2.5", 2.3, 2.4, 2.3, 2.5, 2.7, 2.5, 2.6, 2.6, 2.7, 2.5.

(You are given that upper tail χ^2 value for 10 d. f. at 1% level is 23.2)

- What are non-parametric tests ? Explain the use of (a) Sign Test
(b) Median Test.

OR

- (a) What are contingency tables ? What is their use ?
- (b) Out of 8000 graduates in a town, 800 are females, and out of 1600 graduate employees in the town, 120 are females. Determine if any distinction is made in appointment on the basis of sex. (Note : Value of χ^2 at 5% level of significance for 1 degree of freedom is 3.84).
5. Write short note on Analysis of Variance for two way classification with one observation per cell.

OR

- (a) What is a Latin Square Design ?
- (b) Yields of 4 varieties of wheat tested in 3 blocks are given in the table. Test if the difference between average yields of varieties is significant. Is the difference between blocks significant ?
(Note : $F_{3,6} = 4.76$ and $F_{2,6} = 5.14$ at 5% level of significance).

Variety \ Block	1	2	3
I	10	9	8
II	7	7	6
III	8	5	4
IV	5	4	4

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