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✡ STATISTICAL INFERENCE ✡

PAPER - I

Unit - I :-

Testing of Hypothesis, Null, Alternative, Simple and Composite hypotheses, Two type of errors, Power of the test, Power Curves in Simple Cases, Critical region and best Critical region (BCR). Most powerful and uniformly most powerful tests. Neyman - Pearson's Lemma, Determination of B.C.R for testing Simple v/s Simple hypothesis in uniform and normal populations.

Unit - II :-

General theory of test of significance for large Samples for testing of means and proportions, Determination of Sample size, test of significance based on 't' distribution

Unit - III :-

Tests of Significance based on Chi-Square and F- Sampling distributions.

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Unit - IV :-

Method of estimation: Method of moments, Method of least Squares and Method of Maximum likelihood estimation with their Properties (Without proof).

Unit - V :-

Elements of Non - parametric Inference: Sign, Median and run test.

Elements of Sequential Analysis, Construction of Sequential probability ratio tests (SPRT), O.C. and A.S.N. functions. Applications of SPRT for testing Simple v/s Simple hypothesis in Case of Bernoulli and Normal populations.

Unit - I :-

✱ Statistical Hypotheses :-

↳ Simple and Composite

A Statistical hypothesis is some statement or assertion about a population or equivalently about the probability distribution characterising a population, which we want to verify on the basis of information available from a sample.

If the Statistical hypothesis specifies the population completely then it is termed as a simple Statistical hypothesis otherwise it is called a Composite Statistical hypothesis.

For example, if $X_1, X_2, \ldots X_n$ is a random sample of size n from a normal population with mean μ and variance σ^2, then the hypothesis

$H_0 : \mu = \mu_0 , \quad \sigma^2 = \sigma_0^2$

is a simple hypothesis, whereas each of the following hypothesis is a Composite hypothesis :-

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(i) $\mu = \mu_0$, (ii) $\sigma^2 = \sigma_0^2$
(iii) $\mu < \mu_0$, $\sigma^2 = \sigma_0^2$ (iv) $\mu > \mu_0$, $\sigma^2 = \sigma_0^2$
(v) $\mu = \mu_0$, $\sigma^2 < \sigma_0^2$ (vi) $\mu = \mu_0$, $\sigma^2 > \sigma_0^2$
(vii) $\mu < \mu_0$, $\sigma^2 > \sigma_0^2$.

A hypothesis which does not specify completely 'r' parameters of a population is termed as a composite hypothesis with r degrees of freedom.

- **Null Hypotheses :-** ↳ In hypotheses testing, a statistician or decision maker should not be motivated by prospects of Profit or loss resulting from the acceptance or rejection of the hypotheses.
  He should be Completely impartial.

⇒ A Statement which is Under test.

⇒ A Statement of no difference is known as null hypotheses.

⇒ It is usually denoted by H_0 and is given by

$$\boxed{H_0 : \mu = \mu_0}$$

- **Alternative Hypothesis** :- → A statement which is against the null hypothesis is known as alternative hypothesis. It is usually denoted by H_1 and is given by

$$[H_1 : \mu \neq \mu_0 \text{ or } \mu > \mu_0 \text{ or } \mu < \mu_0]$$