Unit-V

Design of Experiments.

Experiment: A collection of data or measurements of some features of an object.

Treatments: Various objects of comparison in a comparative experiments are called treatments.

Experimental unit: The smallest division of the experimental material to which we apply the treatments.

Blocks: The whole experimental units are divided into subgroups called blocks.

Experimental error: It is the error occured due to random causes or chance causes or non-assignable factors which are beyond our control.

Basic principles of experimental design:

1. Randomisation
2. Replication
3. Local control.

Basic designs of experiment:

1. Completely randomised design (C.R.D or one-way classification)
2. Randomised Block design (R.B.D or two way classification)
3. Latin Square Design (L.S.D or three way classification)

Analysis of Variance (ANOVA)

The analysis of variance is a widely used technique developed by prof. R.A. Fisher.

Uses: It is used to test whether the means of a no. of populations (more than two) are equal.

Assumptions:

1. Each sample taken is a random sample.
2. Each one is independent of the other sample.
3. Populations from which samples are taken are normal.
4. Variances of the populations are equal.

Completely Randomised Design [One-way classification]

This is a one factor experiment:

Procedure:

Step 1:

Null hypothesis: H_0: There is no significant difference between columns and errors.

Alternative hypothesis: H_1: There is a significant difference between columns and errors.

Step 2:

* Find N, number of given observation
* Find T, total no. of observation
* Find correction factor $C.F = \frac{T^2}{N}$

Step 3:

* Sum of squares of treatments

$$S.S.T = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \dots - C.F$$

* Sum of squares of columns.

$$SSC = \frac{(\Sigma x_1)^2}{c_1} + \frac{(\Sigma x_2)^2}{c_2} + \frac{(\Sigma x_3)^2}{c_3} + \dots - C.F$$

* Sum of squares of errors.

$$SSE = SST - SSC$$

Step 4: ANOVA Table:

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	Variance ratio	Table value
Between Columns	$C-1$	SSC	$MSC = \frac{SSC}{C-1}$	$\frac{MSC}{MSE}$ (or) $\frac{MSE}{MSC}$	$F_\alpha(C-1, N-C)$ (or) $F_\alpha(N-C, C-1)$
Between errors	$N-C$	SSE	$MSE = \frac{SSE}{N-C}$		

Step 5: Decision:

If $|F| < F_\alpha$, we accept the hypothesis

$|F| > F_\alpha$, we reject the hypothesis