Topic: 2.3 – One-way classifications - Completely randomized design

One Way Classification:

In One-way classification observations are classified according to one factor This is done Column wise

Completely Randomised Design (C.R.D)

One Way Classification.

The completely radmoised design is the simplest of all the designs based on principles of randomisation and replication. In this design treatments are allocated randomly.

Merits:-

1) CRD results in the maximum use of experimental units.
2). The design is very flexible.
3) The statistical analysis remains simple if some or all observations for any treatment are rejected.
4- It provides the maximum number of degrees of freedom.

CRD Working Procedure.

H_0: There is no significant difference bt the treatments

H_1: There is Significant difference bt the treatments.

Find N

Find T

$$C.F = \frac{T^2}{N}$$

$$TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma \ldots - \frac{T^2}{N}$$

$$SSC = \frac{(\Sigma x_1)^2}{N_1} + \frac{(\Sigma x_2)^2}{N_1} + \ldots - \frac{T^2}{N}$$

$$SSE = TSS - SSC.$$

ANOVA Table:

Source of variation	Sum of Squares	dof	Mean Square	Variance Ratio	Table Value
Between Columns	SSC	C-1	$MSC = \frac{SSC}{C-1}$	$F_C = \frac{MSE}{MSC}$. MSC > MSE	5% or 1% F_C
Error	SSE	N-C	$MSE = \frac{SSE}{N-C}$	(or) MSE > MS	

1. The following are the number of mistakes made in 5 successive days of 4 technicians working for a Photographic laboratory.

Technician I	Technician II	Technician III	Technician IV
x_1	x_2	x_3	x_4
6	14	10	9
14	9	12	12
10	12	7	8
8	10	15	10
11	14	11	11

Test at 1% level of significance whether the difference among the 4 sample means can be attributed to chance.

H_0: There is no significant difference between the techniciens.

H_1: There is significant difference between techniciens.

Shift the origin to 10

X_1	X_2	X_3	X_4	Total	X_1^2	X_2^2	X_3^2	X_4^2
-4	4	0	-1	-1	16	16	0	1
4	-1	2	2	7	16	1	4	4
0	2	-3	-2	-3	0	4	9	4
-2	0	5	0	3	4	0	25	0
1	4	1	1	7	1	16	1	1
-1	9	5	6	13	37	37	39	10

$N = 20$

$T = 13$

$\frac{T^2}{N} = 8.45$

$TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \Sigma x_4^2$

$= 37 + 37 + 39 + 10 - 8.45 = 114.55$

$SSC = \frac{(\Sigma x_1)^2}{N_1} + \frac{(\Sigma x_2)^2}{N_1} + \frac{(\Sigma x_3)^2}{N_1} + \frac{(\Sigma x_4)^2}{N_1} - \frac{T^2}{N}$

$= \frac{(-1)^2}{5} + \frac{(9)^2}{5} + \frac{(5)^2}{5} - 0 - 8.45$ (N_1 → no of elements in each column)

$= 12.95$

$SSE = TSS - SSC$

$= 114.55 - 12.95 = 101.6$

ANOVA

Source of Variation	Sum of Squares	dof	Mean Square	Variation Table
Bt columns	SSC = 12.45	C-1 = 4-1 = 3	MSC = SSC/(C-1) = 4.317	$F_c = \frac{MSE}{MSC} = 1.471$
Error	SSE = 101.6	N-C = 20-4 = 16	MSE = SSE/(N-C) = 6.35	MSE > MSC

Table Value:
$F_c(16,3) = 5.29$

Conclusion:
Cal.V < T.V
H_0 accepted.