Topic: 2.6 – Two-way classification-Randomized block design

12 Two way Classification.

In two-way classification of analysis of variance, we consider one classification along column wise other one row wise.

RBD [Randomised Block Design]

K treatments given to k plots in a perfectly random manner, such that each treatment occurs only once in each block.

Merits (Advantages.

⇒ It has a simple layout

⇒ The design controls the variability in the experimental units and gives the treatments equivalence to show their effects.

⇒ The analysis of the design is simple and straightforward.

Working Procedure :

H_0: There is no significant difference

H_1: There is significant difference.

Find N

Find T

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

$$TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \cdots - \frac{T^2}{N}$$

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

$$SSR = \frac{(\Sigma y_1)^2}{N_2} + \frac{(\Sigma y_2)^2}{N_2} + \frac{(\Sigma y_3)^2}{N_2} + \cdots - \frac{T^2}{N}$$

$$SSE = TSS - SSC - SSR.$$

$$MSC = \frac{SSC}{c-1}$$

$$MSR = \frac{SSR}{r-1}$$

Sources of Variation	Sum of Squares	dof	Mean Sum of Squares	Variance Ratio	Table value
Between Columns	SSC	$C-1$	MSC	$MSC > MSE$ $F_C = \frac{MSC}{MSE}$	$F_C(\ \ )$
Between Rows	SSR	$r-1$	MSR	$MSR > MSE$ $F_R = \frac{MSR}{MSE}$	$F_R(\ \ )$
Error	SSE	$N-c-r+1$	MSE		

C.V < T.V

H_0 accepted.

1) Perform two-way ANOVA for the gn below: 15

Treatment

Plots of land	A	B	C	D
I	38	40	41	39
II	45	42	49	36
III	40	38	42	42

Solution :

Shift the origin to 40 .

	X_1	X_2	X_3	X_4	T	X_1^2	X_2^2	X_3^2	X_4^2
Y_1	-2	0	1	-1	-2	4	0	1	1
Y_2	5	2	9	-4	12	25	4	81	16
Y_3	0	-2	2	2	2	0	4	4	4
T	3	0	12	-3	12	29	8	86	21

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H_0: There is no significant difference between column as well as row.

H_1: There is significant difference between Column or row.

$N = 12$

$T = 12$.

$C.F = \frac{T^2}{N} = 12$.

$TSS = \Sigma X_1^2 + \Sigma X_2^2 + \Sigma X_3^2 + \Sigma X_4^2 - \frac{T^2}{N}$

$= 29 + 8 + 86 + 21 - 12$

$= 132$

$$SSC = \frac{(\Sigma x_1)^2}{n_1} + \frac{(\Sigma x_2)^2}{n_1} + \frac{(\Sigma x_3)^2}{n_1} + \frac{(\Sigma x_4)^2}{n_1} - \frac{T^2}{N}$$

$$= \frac{9}{3} + \frac{0}{3} + \frac{144}{3} + \frac{9}{3} - 12$$

$$= 42$$

$$SSR = \frac{(\Sigma y_1)^2}{n_2} + \frac{(\Sigma y_2)^2}{n_2} + \frac{(\Sigma y_3)^2}{n_2} - \frac{T^2}{N}$$

$$= \frac{4}{4} + \frac{144}{4} + \frac{4}{4} - 12 = 26.$$

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$$SSE = TSS - SSC - SSR$$

$$= 132 - 42 - 26 = 64.$$

$$MSC = \frac{SSC}{c-1} = \frac{42}{3} = 14$$

$$MSR = \frac{SSR}{r-1} = \frac{26}{2} = 13$$

$$MSE = \frac{SSE}{N-c-r+1} = \frac{64}{6} = 10.67$$

Source of variation	Sum of Squares	dof	Mean sum of Squares	Variation radio.
Bt columns	SSC = 42	c-1 = 3	MSC = 14	MSC > MSE $F_C = \frac{MSC}{MSE} = \frac{14}{10.67} = 1.31$
Bt rows	SSR = 26	r-1 = 3-1 = 2	MSR = 13	MSR > MSE $F_R = \frac{MSR}{MSE} = \frac{13}{10.67} = 1.22$
Error	SSE = 132	N-c-r+1 = 6	MSE = 10.67	

T.V $F_C(3,6) = 4.76$ $F_R(2,6) = 5.14$

F_C C.V T.V

1.31 < 4.76

F_R C.V T.V

1.22 < 5.14.

H_0 acceptep column wise and row wise.