H/W.
9. Perform a two-way classification to the following data.

Varieties	Block A	Block B	Block C	Block D
I	8	5	5	7
II	7	6	4	4
III	3	6	5	4

Sol:-

	X_1	X_2	X_3	X_4	Total	X_1^2	X_2^2	X_3^2	X_4^2
Y_1	8	5	5	7	$\Sigma Y_1 = 25$	64	25	25	49
Y_2	7	6	4	4	$\Sigma Y_2 = 21$	49	36	16	16
Y_3	3	6	5	4	$\Sigma Y_3 = 18$	9	36	25	16
Total	$\Sigma x_1 = 18$	$\Sigma x_2 = 17$	$\Sigma x_3 = 14$	$\Sigma x_4 = 15$	$T = 64$	$\Sigma x_1^2 = 122$	$\Sigma x_2^2 = 97$	$\Sigma x_3^2 = 66$	$\Sigma x_4^2 = 81$

Step 1:

H_0 - There's no significant difference b/w the column means or row means.

H_1 - There is significant difference b/w the column means or row means.

Step 2: $N = 12$.

Step 3: $T = 64$.

Step 4: $\frac{T^2}{N} = \frac{64^2}{12} = 341.33$.

Step 5:

$TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \Sigma x_4^2 - T^2/N$

$= 122 + 97 + 66 + 81 - 341.33$

$TSS = 24.67$

Step 6:

$$SSC = \frac{(\Sigma X_1)^2}{N_1} + \frac{(\Sigma X_2)^2}{N_1} + \frac{(\Sigma X_3)^2}{N_1} + \frac{(\Sigma X_4)^2}{N_1} - \frac{T^2}{N}.$$

$$= \frac{18^2}{3} + \frac{17^2}{3} + \frac{14^2}{3} + \frac{15^2}{3} - 341.33$$

$$= 18^2/4 + 17^2/4 + 14^2/3 + 15^2/4 = 81 + 72.25 + 49 + 56.25 - 341.33$$

$$= 108 + 96.33 + 65.33 + 75 - 341.33$$

$SSC = 3.33$ $\qquad = -82.83.$

Step 7:

$$SSR = \frac{(\Sigma Y_1)^2}{N_2} + \frac{(\Sigma Y_2)^2}{N_2} + \frac{(\Sigma Y_3)^2}{N_2} - \frac{T^2}{N}.$$

$$= 156.25 + 110.25 + 81 - 341.33$$

$SSR = 6.17$

Step 8:

$SSE = TSS - SSC - SSR$

$= 26.67 - 3.33 - 6.17$

$SSE = 15.17$

Step 9: ANOVA Table:

Source of Variation	Sum of squares	DoF	Mean squares	Variance ratio	Table Value
Between column	$SSC = 3.33$	$c-1 = 4-1 = 3$	$MSC = \frac{SSC}{c-1} = 3.33/3$ $MSC = 1.11$	$F_C = \frac{MSE}{MSC} = \frac{2.528}{1.11}$ $F_C = 2.277$	$F_C(6,3) = 8.94$
Between rows	$SSR = 6.17$	$r-1 = 3-1 = 2$	$MSR = \frac{SSR}{r-1} = \frac{6.17}{2}$ $MSR = 3.085$	$F_R = \frac{MSR}{MSE} = \frac{3.085}{2.528}$ $F_R = 1.220$	$F_R(2,6) = 5.14$
Error	$SSE = 15.17$	$(c-1)(r-1) = 3\times 2 = 6$	$MSE = \frac{SSE}{(r-1)(c-1)} = \frac{15.17}{6}$ $MSE = 2.528$		

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Step 10: conclusion:

Here F_c cal < F_c tab, F_R cal < F_R tab.

∴ In both cases, we accept H_0

~~A variable trial was conducted on wheat with 4 variet~~

Latin Square Design:-

Latin square Design is very popular in agricultural research where it is not possible to have a large number of (objects) subjects.

Working Rule:-

Step 1: Find N

Step 2: Find T

Step 3: Find T^2/N

Step 4: Find TSS

Step 5: Find SSC

Step 6: Find SSR, Find SSK

Step 7: ANOVA table

Step 8: Conclusion.

~~Step 9:~~

~~Step~~

Source of Variation	Sum of squares	DoF	Mean sum of squares	Variance ratio	Table value
Between column	SSC	$k-1$	$MSC = \frac{SSC}{K-1}$	$F_c = \frac{MSC}{MSE}$	
Between rows	SSR	$k-1$	$MSR = \frac{SSR}{K-1}$	$F_R = \frac{MSR}{MSE}$	
Between treatments	SSK	$k-1$	$MSK = \frac{SSK}{K-1}$	$F_T = \frac{MSK}{MSE}$	
Error	SSE	$(k-1)(k-2)$	$MSE = \frac{SSE}{(K-1)(K-2)}$	-	-

Problems:-

10. The following is the latin square of the design when four variety of seeds are tested setup the analysis variance table and state your conclusion. You may carry out suitable change is origin and scale

A	105	B	95	C	125	D	115
C	115	D	125	A	105	B	105
D	115	C	95	B	105	A	115
B	95	A	135	D	95	C	115

Solution:-

Origin = Subtract 100 then divided by 5.

		X_1		X_2		X_3		X_4
Y_1	A	1	B	-1	C	5	D	3
Y_2	C	3	D	5	A	1	B	1
Y_3	D	3	C	-1	B	1	A	3
Y_4	B	-1	A	7	D	-1	C	3

	X_1	X_2	X_3	X_4	Total	X_1^2	X_2^2	X_3^2	X_4^2
Y_1	1	-1	5	3	$\Sigma Y_1 = 8$	1	1	25	9
Y_2	3	5	1	1	$\Sigma Y_2 = 10$	9	25	1	1
Y_3	3	-1	1	3	$\Sigma Y_3 = 6$	9	1	1	9
Y_4	-1	7	-1	3	$\Sigma Y_4 = 8$	1	49	1	9
Total	$\Sigma X_1 = 6$	$\Sigma X_2 = 10$	$\Sigma X_3 = 6$	$\Sigma X_4 = 10$	$T = 32$	$\Sigma X_1^2 = 20$	$\Sigma X_2^2 = 76$	$\Sigma X_3^2 = 28$	$\Sigma X_4^2 = 28$

H_0: There's no significant difference b/w column means, row means and treatments.

H_1: There's significant difference b/w column means, row means and treatments.

Step 1: $N = 16.$

Step 2: $T = 32$

Step 3: $\frac{T^2}{N} = \frac{32^2}{16} = 64.$

Step 4: $TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \Sigma x_4^2 - \frac{T^2}{N}$

$= 20 + 76 + 28 + 28 - 64$

$TSS = 88$

Step 5: $SSC = \frac{(\Sigma x_1)^2}{N_1} + \frac{(\Sigma x_2)^2}{N_1} + \frac{(\Sigma x_3)^2}{N_1} + \frac{(\Sigma x_4)^2}{N_1} - \frac{T^2}{N}$

$= \frac{6^2}{4} + \frac{10^2}{4} + \frac{6^2}{4} + \frac{10^2}{4} - 64$

$SSC = 4$

Step 6: $SSR = \frac{(\Sigma y_1)^2}{N_2} + \frac{(\Sigma y_2)^2}{N_2} + \frac{(\Sigma y_3)^2}{N_2} + \frac{(\Sigma y_4)^2}{N_2} - \frac{T^2}{N}$

$= \frac{8^2}{4} + \frac{10^2}{4} + \frac{6^2}{4} + \frac{8^2}{4} - 64$

$SSR = 2.$

Step 7: SSK: Arrange the elements in the order of treatments.

To find SSK:-

					Total
A	1	1	3	7	12
B	-1	1	1	-1	0
C	5	3	-1	3	10
D	3	5	3	-1	10

$SSK = \frac{12^2}{4} + \frac{0^2}{4} + \frac{10^2}{4} + \frac{10^2}{4} - \cancel{\left(\frac{T^2}{N}\right)} [64]$

$SSK. = 22$

Step 8:

$SSE = TSS - SSC - SSR - SSK$

$= 84 - 4 - 2 - 22$

$SSE = 60$

Step 9 : ANOVA Table :-

Source of Variation	Sum of Squares	DoF	Mean Squares	Variance ratio	Table Value
Between columns	SSC = 4	K - 1 = 4 - 1 = 3	$MSC = \frac{SSC}{K-1} = \frac{4}{3}$ MSC = 1.33	$F_C = \frac{MSE}{MSC} = \frac{10}{1.33}$ $F_C = 7.52$	$F_C(6,3) = 8.94$
Between rows	SSR = 2	K - 1 = 3	$MSR = \frac{SSR}{K-1} = \frac{2}{3}$ MSR = 0.69	$F_R = \frac{MSE}{MSR} = \frac{10}{0.67}$ $F_R = 14.9$	$F_R(6,3) = 8.94$
Between treat-ments	SSK = 22	K - 1 = 3	$MSK = \frac{SSK}{K-1} = \frac{22}{3}$ MSK = 7.33	$F_T = \frac{MSE}{MSR} = \frac{10}{7.33}$ $F_T = 1.36$	$F_T(6,3) = 8.94$
Errors	SSE = 60	(K - 1) × (K - 2) = 6	$MSE = \frac{SSE}{(K-1)(K-2)} = \frac{60}{6}$ MSE = 10		

Step 10: Conclusion :-

cal F_C < Tab F_C ; So we accept H_0.

cal F_R > Tab F_R ; So we reject H_0.

cal F_T < cal F_T ; So we accept H_0.

A variable trail was conducted on wheat with 4 varieties in a Latin square design. The plan of the experiment and the yield are given below. Analyse the data of interpret the result.

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

Sol:- Origin = 20.

C	5	B	3	A	0	D	0
A	−1	D	−1	C	1	B	−2
B	−1	A	−6	D	−3	c	0
D	−3	C	0	B	1	A	−5

	X_1	X_2	X_3	X_4	Total	X_1^2	X_2^2	X_3^2	X_4^2
Y_1	5	3	0	0	$\Sigma y_1 = 8$	25	9	0	0
Y_2	−1	−1	1	−2	$\Sigma y_2 = -3$	1	1	1	4
Y_3	−1	−6	−3	0	$\Sigma y_3 = -10$	1	36	9	0
Y_4	−3	0	1	−5	$\Sigma y_4 = -7$	9	0	1	25
Total	$\Sigma X_1 = 0$	$\Sigma X_2 = -4$	$\Sigma X_3 = -1$	$\Sigma X_4 = -7$	$T = -12$	$\Sigma X_1^2 = 36$	$\Sigma X_2^2 = 46$	$\Sigma X_3^2 = 11$	$\Sigma X_4^2 = 29$

Step 1: $N = 16$

Step 2: ~~T = 12~~ $T = -12$

Step 3: $T^2/N = (-12)^2/16 = 9$

Step 4: $TSS = \Sigma X_1^2 + \Sigma X_2^2 + \Sigma X_3^2 + \Sigma X_4^2 - \frac{T^2}{N}$

$= 36 + 46 + 11 + 29 - 9$

$TSS = 113$

H_0: There's no significant difference b/w column means, row means and treatments.

H_1: There is significant difference b/w column means, row means and treatments.

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Step 5: $SSC = \frac{(\Sigma X_1)^2}{N_1} + \frac{(\Sigma X_2)^2}{N_1} + \frac{(\Sigma X_3)^2}{N_1} + \frac{(\Sigma X_4)^2}{N_1} - \frac{T^2}{N}$

$= \frac{0^2}{4} + \frac{(-4)^2}{4} + \frac{(-1)^2}{4} + \frac{(-7)^2}{4} - 9$

$SSC = 7.5$

Step 6: $SSR = \frac{(\Sigma Y_1)^2}{N_2} + \frac{(\Sigma Y_2)^2}{N_2} + \frac{(\Sigma Y_3)^2}{N_2} + \frac{(\Sigma Y_4)^2}{N_2} - \frac{T^2}{N}$

$= \frac{8^2}{4} + \frac{(-3)^2}{4} + \frac{(-10)^2}{4} + \frac{(-7)^2}{4} - 9$

$SSR = 46.5$

Step 7: To find SSK.

					~~Total~~ Total
A	0	-1	-6	-5	-12
B	3	-2	-1	1	1
C	5	1	0	0	6
D	0	-1	-3	-3	-7

$SSK = \frac{(\Sigma A)^2}{N_3} + \frac{(\Sigma B)^2}{N_3} + \frac{(\Sigma C)^2}{N_3} + \frac{(\Sigma D)^2}{N_3} - \frac{T^2}{N}$

$= \frac{(-12)^2}{4} + \frac{1^2}{4} + \frac{6^2}{4} + \frac{(-7)^2}{4} - 9$

$SSK = 48.5$

Step 8:

$SSE = TSS - SSC - SSR - SSK$

$= 113 - 7.5 - 46.5 - 48.5$

$SSE = 10.5$ //.

Step 9: ANOVA Table:-

Source of variation	Sum of squares	DoF	Mean of squares	Variance ratio	Table value
Between columns	SSC = 7.5	$k-1$ = 4−1 = 3	$MSC = \frac{SSC}{K-1} = \frac{7.5}{3}$ MSC = 2.5	$F_c = \frac{MSC}{MSE} = \frac{2.5}{1.75}$ $F_c = 1.428$	$F_c(3,6) = 4.76$
Between rows	SSR = 46.5	$K-1 = 4-1 = 3$	$MSR = \frac{SSR}{K-1} = \frac{46.5}{3}$ MSR = 15.5	$F_R = \frac{MSR}{MSE} = \frac{15.5}{1.75}$ $F_R = 8.857$	$F_R(3,6) = 4.76$
Between treatments	SSK = 48.5	$K-1 = 3$	$MSK = \frac{SSK}{K-1} = \frac{48.5}{3}$ MSK = 16.17	$F_T = \frac{MSK}{MSE} = \frac{16.17}{1.75}$ FT = 9.24	$F_T(3,6) = 4.76.$
Error	SSE = 10.5	$(k-1)(k-2) = 3\times2 = 6$	$MSE = \frac{SSE}{6} = \frac{10.5}{6}$ MSE = 1.75		

Step 10: Conclusion:-

F_c cal < F_c Tab, we accept Ho.

F_R cal > F_R tab, we reject Ho.

F_T cal > F_T ~~cal~~ Tab, we reject Ho

12. Five varieties of wheat, A, B, C, D and E were tired. The gross size of the plot was 18x22 ft the net plot being 14x 18 feet, Thus the whole experiment occupied an area 90 X 110 ft. The Plan the varieties shown in each plot and yields obtained in kg. Are given in following table. Carry out an analysis of variance. What inference can you draw from the data given?

B	90	E	80	C	134	A	112	D	92
E	85	D	84	B	70	C	141	A	82
C	110	A	90	D	87	B	84	E	69
A	81	C	125	E	85	D	76	B	72
D	82	B	60	A	94	E	85	C	88

Sol:-

origin = subtract 100.

B	-10	E	-20	C	34	A	12	D	-8
E	-15	D	-16	B	-30	C	41	A	-18
C	10	A	-10	D	-13	B	-16	E	-31
A	-19	C	25	E	-15	D	-24	B	-28
D	-18	B	-40	A	-6	E	-15	C	-12

H_0: There's no significant difference b/w column means, row means and treatments.

H_1: There is significant difference b/w column means, row means and treatments.

	X_1	X_2	X_3	X_4	X_5	Total	X_1^2	X_2^2	X_3^2	X_4^2	X_5^2
Y_1	-10	-20	34	12	-8	$\Sigma Y_1 = 8$	100	400	1156	144	64
Y_2	-15	-16	-30	41	-18	$\Sigma Y_2 = -38$	225	256	900	1681	324
Y_3	10	-10	-13	-16	-31	$\Sigma Y_3 = -60$	100	100	169	256	961
Y_4	-19	25	-15	-24	-28	$\Sigma Y_4 = -61$	361	625	225	576	784
Y_5	-18	-40	-6	-15	-12	$\Sigma Y_5 = -91$	324	1600	36	225	144
Total	$\Sigma X_1 = -52$	$\Sigma X_2 = -61$	$\Sigma X_3 = -30$	$\Sigma X_4 = -2$	$\Sigma X_5 = -97$	$T = -242$	$\Sigma X_1^2 = 1110$	$\Sigma X_2^2 = 2981$	$\Sigma X_3^2 = 2486$	$\Sigma X_4^2 = 2882$	$\Sigma X_5^2 = 2277$

step 1: $N = 25$

step 2: $T = -242$

step 3: $\frac{T^2}{N} = \frac{(242)^2}{25} = \frac{58564}{25} = 2342.56$

step 4:

$$TSS = \Sigma X_1^2 + \Sigma X_2^2 + \Sigma X_3^2 + \Sigma X_4^2 + \Sigma X_5^2 - \frac{T^2}{N}$$

$$= 1110 + 2981 + 2486 + 2882 + 2277 - 2342.5$$

$$TSS = 9393.44$$

step 5:

$$SSC = \frac{(\Sigma X_1)^2}{N_1} + \frac{(\Sigma X_2)^2}{N_1} + \frac{(\Sigma X_3)^2}{N_1} + \frac{(\Sigma X_4)^2}{N_1} + \frac{(\Sigma X_5)^2}{N_1} - \frac{T^2}{N}$$

$$= \frac{(52)^2}{5} + \frac{(-61)^2}{5} + \frac{(-30)^2}{5} + \frac{(-2)^2}{5} + \frac{(-97)^2}{5} - 2342.56$$

$$= 540.8 + 744.2 + 180 + 0.8 + 1881.8 - 2342.56$$

$$SSC = 1005.04.$$

step 6:

$$SSR = \frac{(\Sigma Y_1)^2}{N_2} + \frac{(\Sigma Y_2)^2}{N_2} + \frac{(\Sigma Y_3)^2}{N_2} + \frac{(\Sigma Y_4)^2}{N_2} + \frac{(\Sigma Y_5)^2}{N_2} - \frac{T^2}{N}$$

$$= \frac{8^2}{5} + \frac{(-38)^2}{5} + \frac{(-60)^2}{5} + \frac{(-61)^2}{5} + \frac{(-91)^2}{5} - 2342.56$$

$$= 12.8 + 288.8 + 720 + 744.2 + 1656.2 - 2342.56$$

$$SSR = 1079.44$$

Step 7: To find SSK.

						Total =
A	12	-18	-10	-19	~~-18~~ -6	-41
B	-10	-30	-16	-28	-40	-124
C	34	41	10	25	-12	98
D	-8	-16	-13	-24	-18	-79
E	-20	-15	-31	-15	-15	-96

$$SSK = \frac{(\Sigma A)^2}{N_3} + \frac{(\Sigma B)^2}{N_3} + \frac{(\Sigma C)^2}{N_3} + \frac{(\Sigma D)^2}{N_3} + \frac{(\Sigma E)^2}{N_3} - \frac{T^2}{N}.$$

$$= \frac{(-41)^2}{5} + \frac{(-124)^2}{5} + \frac{(98)^2}{5} + \frac{(-79)^2}{5} + \frac{(-96)^2}{5} - 2342.56$$

$$= 336.2 + 3075.2 + 1920.8 + 1248.2 + 1843.2 - 2342.56$$

$SSK. = 6081.04$

Step 8:

$SSE = TSS - SSC - SSR - SSK$

$= 9393.44 - 1005.04 - 1079.44 - 6081.04$

$SSE = 1227.92$

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Step 9: ANOVA Table:-

Source of Variation	Sum of Squares	DoF	Mean Squares	Variance ratio	Table Value
Between column	$SSC = 1005.04$	$K-1 = 5-1 = 4$	$MSC = \frac{SSC}{K-1} = \frac{1005.04}{4}$, $MSC = 251.26$	$F_C = \frac{MSC}{MSE} = \frac{251.26}{102.32}$, $F_C = 2.455$	$F_C(4,12) = 3.26$
Between rows	$SSR = 1079.44$	$K-1=4$	$MSR = \frac{SSR}{K-1} = \frac{1079.44}{3}$, $MSR = 269.86$	$F_R = \frac{MSR}{MSE} = \frac{269.86}{102.82}$, $F_R = 2.637$	$F_R(4,12) = 3.26$
Between treatments	$SSK = 6081.04$	$K-1=4$	$MSK = \frac{SSK}{K-1} = \frac{6081.04}{4}$, $MSK = 1520.26$	$F_T = \frac{MSK}{MSE} = \frac{1520.26}{102.32}$, $F_T = 14.857$	$F_T(4,12) = 3.26$
Errors	$SSE = 1227.92$	$(K-1) \times (K-2) = 4 \times 3 = 12$	$MSE = \frac{SSE}{K-1 \times K-2} = \frac{1227.92}{12}$, $MSE = 102.32$		

Step 10: Conclusion.

$\therefore F_C$ cal < F_C tab, we accept H_0

F_R cal < F_R tab, we accept H_0

F_T cal > F_T tab, we reject H_0.

3. Analyze the following Latin square experiments. The letters A, B, C, D denote the treatments and the figures in brackets denote the observations.

Column / row	1		2		3		4	
1	A	12	D	20	C	16	B	10
2	D	18	A	14	B	11	C	14
3	B	12	C	15	D	19	A	13
4	C	16	B	11	A	15	D	20

Sol:-

origin ⇒ subtract = 12.

		X_1		X_2		X_3		X_4
Y_1	A	0	D	8	C	4	B	−2
Y_2	D	6	A	2	B	−1	C	2
Y_3	B	0	C	3	D	7	A	1
Y_4	C	4	B	−1	A	3	D	8

	X_1	X_2	X_3	X_4	Total	X_1^2	X_2^2	X_3^2	X_4^2
Y_1	0	8	4	−2	$\Sigma Y_1 = 10$	0	64	16	4
Y_2	6	2	−1	2	$\Sigma Y_2 = 9$	36	4	1	4
Y_3	0	3	7	1	$\Sigma Y_3 = 11$	0	9	49	1
Y_4	4	−1	3	8	$\Sigma Y_4 = 14$	16	1	9	64
Total	$\Sigma X_1 = 10$	$\Sigma X_2 = 12$	$\Sigma X_3 = 13$	$\Sigma X_4 = 9$	$T = 44$	$\Sigma X_1^2 = 52$	$\Sigma X_2^2 = 78$	$\Sigma X_3^2 = 75$	$\Sigma X_4^2 = 73$

H_0 : There's no significant difference b/w Column means, row means and treatments means.

H_1 : There is significant difference b/w Column means, row means and treatments

Step 1: $N = 16$

Step 2: $T = 44$

Step 3: $\frac{T^2}{N} = \frac{44^2}{16} = 121$

Step 4:

$$TSS = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \Sigma x_4^2 - \frac{T^2}{N}$$

$$= 52 + 78 + 75 + 73 - 121$$

$$TSS = 157$$

Step 5:

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

$$= \frac{10^2}{4} + \frac{12^2}{4} + \frac{13^2}{4} + \frac{9^2}{4} - 121$$

$$SSC = 2.5$$

Step 6:

$$SSR = \frac{(\Sigma y_1)^2}{N_2} + \frac{(\Sigma y_2)^2}{N_2} + \frac{(\Sigma y_3)^2}{N_2} + \frac{(\Sigma y_4)^2}{N_2} - \frac{T^2}{N}$$

$$= \frac{10^2}{4} + \frac{9^2}{4} + \frac{11^2}{4} + \frac{14^2}{4} - 121$$

$$SSR = 3.5$$

Step 7: To find SSK.

Arrange the elements on the order of treatments.

A	0	2	3	1	Total 6
B	0	-1	-1	-2	-4
C	4	3	4	2	13
D	6	8	7	8	29

$$SSK = \frac{(\Sigma A)^2}{N_3} + \frac{(\Sigma B)^2}{N_3} + \frac{(\Sigma C)^2}{N_3} + \frac{(\Sigma D)^2}{N_3} - \frac{T^2}{N}$$

$$= \frac{6^2}{4} + \frac{(-4)^2}{4} + \frac{(13)^2}{4} + \frac{(29)^2}{4} - 12$$

$$SSK = 144.5$$

Step 8: $SSE = TSS - SSC - SSR - SSK$

$= 157 - 2.5 - 3.5 - 144.5$

$SSE = 6.5$

Step 9: ANOVA Table:-

Source of Variation	Sum of squares	DoF	Mean squares	Variance ratio	Table Value
Between column	$SSC = 2.5$	$k-1 = 4-1 = 3$	$MSC = \frac{SSC}{k-1} = \frac{2.5}{3}$; $MSC = 0.83$	$F_C = \frac{MSE}{MSC} = \frac{1.08}{0.83}$; $F_C = 1.301$	$F_C(6,3) = 8.94$
Between rows	$SSR = 3.5$	$k-1 = 3$	$MSR = SSR/k-1 = 3.5/3$; $MSR = 1.167$	$F_R = \frac{MSR}{MSE} = \frac{1.167}{1.08}$; $F_R = 1.08$	$F_R(3,6) = 4.76$
Between treatments	$SSK = 144.5$	$k-1 = 3$	$MSK = SSK/k-1 = 144.5/3$; $MSK = 48.167$	$F_T = \frac{MSK}{MSE} = \frac{48.167}{1.08}$; $F_T = 44.6$	$F_T(3,6) = 4.76$
Error	$SSE = 6.5$	$k-1 \times k-2 = 3\times2 = 6$	$MSE = SSE/6 = 6.5/6$; $MSE = 1.08$		

Step 10: conclusion:

F_C cal < F_C tab, we accept H_0

F_R cal < F_R tab, we accept H_0

F_T cal > F_T tab, we reject H_0