Problem 1 :

A completely randomised design experiment with 10 plots and 3 treatments gave the following results.

Plot No :	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

Analyse the result for treatment effects.

Solution :

Step 1) Null Hypothesis :

H_0 : There is no significant difference among the average yields in the 3 treatments.

Table value

Fcal for (C-1, N-C)

Fcal for (N-C, C-1)

Step 2 : Alternative Hypothesis:

H_1: There is significant difference among the average yields in the 3 treatments.

Table: 1

Treatments	Yields from Plots			
A	5	7	3	1
B	4	4	7	–
C	3	5	1	–

Table 2

Treatment A		Treatment B		Treatment C	
X_1	X_1^2	X_2	X_2^2	X_3	X_3^2
5	25	4	16	3	9
7	49	4	16	5	25
3	9	7	49	1	1
1	1	–	–		
$\Sigma X_1 = 16$	$\Sigma X_1^2 = 84$	$\Sigma X_2 = 15$	$\Sigma X_2^2 = 81$	$\Sigma X_3 = 9$	$\Sigma X_3^2 = 35$

Step 3

N = Total No. of Plots

N = 10

C = Total No. of Treatments

C = 3

Step 4: $T = \Sigma x_1 + \Sigma x_2 + \Sigma x_3$

$= 16 + 15 + 9 = 40$

$\boxed{T = 40}$

Step 5: $CF = \frac{T^2}{N} = \frac{40^2}{10}$

$= \frac{1600}{10}$

$\boxed{CF = 160}$

Step 6: $SST = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 - CF$

$= 84 + 81 + 35 - 160$

$\boxed{SST = 40}$

Step 7: $SSC = \frac{(\Sigma x_1)^2}{n_1} + \frac{(\Sigma x_2)^2}{n_2} + \frac{(\Sigma x_3)^2}{n_3} - C.F$

$= \frac{(16)^2}{4} + \frac{(15)^2}{3} + \frac{(9)^2}{3} - 160$

$= 64 + 75 + 27 - 160$

$\boxed{SSC = 6}$

Step 8: $MSC = \frac{SSC}{c-1}$

$= \frac{6}{3-1} = \frac{6}{2}$

$\boxed{MSC = 3}$

Step 9: $SSE = SST - SSC$

$= 40 - 6$

$\boxed{SSE = 34}$

Step 10: $MSE = \frac{SSE}{N-C} = \frac{34}{10-3} = \frac{34}{7}$

$\boxed{MSE = 4.86}$

Step 11: ANOVA Table.

Source of Variation	D.o.f	Sum of Squares	Mean Sum of Squares	Variance ratio F_{cal}	Table Value F_{tab}
B/w Columns	$C-1$ $=3-1$ $=2$	SSC $=6$	MSC $=3$	$\frac{MSE}{MSC}$	$F_{tab}(7,2)$
B/w Errors	$N-C$ $=10-3$ $=7$	SSE $=34$	MSE $=4.86$	$F_{cal}=\frac{4.86}{3}$ $=1.62$	$=19.35$

Step 12: Conclusion

$F_{cal} < F_{tab}$ at $(7,2)$ d.f at 5% L.O.S

∴ We acept the null hypothesis

i.e., There is no significant difference among the average yields in the 3 treatments.

i.e., the 3 treatments are not significantly different.