[B] Statistical Analysis for two factors:

Let the first factor allocated to main plots be A at m levels viz., $a_1, a_2, \ldots, a_m$ and the second factor allocated to subplots be B at n levels viz., $b_1, b_2, \ldots, b_n$. The number of replications or blocks are r. Let us suppose that we want to test the effect of these two factors on the yield of crop.

Total number of replications or blocks $= r$

Total number of main plots $= mr$

Total number of sub-plots $= mnr$

The total number of main plots receiving any level a_i $(i = 1, 2, \ldots, m)$ of factor A $= r$.

The total number of subplots in all r blocks receiving any level b_i $(i = 1, 2, \ldots, n)$ of factor B $= mr$.

Hypothesis:

H_{01} : The main or Whole plot treatments do not differ significantly.

H_{02} : The sub plot treatments do not differ significantly.

H_{03} : The intersection effects between main plots treatment and sub plot treatment is not significant.

Now we arrange the data in the form of table - 1.

Table - 1:

Factor A / Factor B	B_1				B_2				......	B_r				Grand Total
	Levels			Total	Levels			Total	......	Levels			Total	
	a_1	a_2 ...	a_m		a_1	a_2 ...	a_m			a_1	a_2 ...	a_m		
b_1	...				...				...	...				
b_2	...				...				...	...				
⋮	⋮				⋮				⋮	⋮				
b_n	...				...				...	...				
Total														

From table - 1, we prepare table - 2.

Table -2

Blocks	Levels of factor -A						Total
	a_1	a_2	...	a_i	...	a_m	
B_1	$(a_1 B_1)$	$(a_2 B_1)$	...	$(a_i B_1)$	...	$(a_m B_1)$	(B_1)
B_2	$(a_1 B_2)$	$(a_2 B_2)$	...	$(a_i B_2)$	...	$(a_m B_2)$	(B_2)
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
B_k	$(a_1 B_k)$	$(a_2 B_k)$	...	$(a_i B_k)$	...	$(a_m B_k)$	(B_k)
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
B_r	$(a_1 B_r)$	$(a_2 B_r)$	...	$(a_i B_r)$	...	$(a_m B_r)$	(B_r)
Total	(a_1)	(a_2)	...	(a_i)	...	(a_m)	(G)

where (a_i) denotes the total yield of nr sub plots all having i^{th} level of factor A or (a_i) denotes the total yield of nr sub plots due to i^{th} level of factor A $(i = 1, 2, \ldots, m)$.

(B_k) denote the total yield of mn sub-plots of k^{th} blocks $(k = 1, 2, \ldots, r)$.

$(a_i B_k)$ denotes the total yield of n subplots due to i^{th} level of factor A in k^{th} block.

From table 1, calculate C.F and $(T.S.S)_1$ as follows.

$$C.F = \frac{G^2}{mnr} = \frac{G^2}{N} \; ; N = mnr$$

$$(T.S.S)_1 = \sum\sum\sum (a_i b_j B_k)^2 \; ; \; i = 1, 2, \ldots, m$$
$$j = 1, 2, \ldots, n$$
$$k = 1, 2, \ldots, r$$

(where $a_i b_j B_k$ denotes the value of the observation (say yield) of the experimental unit (say plot) receiving a_i level of factor A and b_j level of factor B from the replication B_k).

<u>From table 2:</u>

We calculate $(T.S.S)_2$, S.S (due to block A), S.S (due to factor A) and S.S (due to error (a)) as follows.

$$(T.S.S)_2 = \sum_i \sum_k \frac{[(a_i B_k)]^2}{n} - C.F$$

$$S.S\,(\text{due to blocks}) = \sum_k \frac{[(B_k)]^2}{mn} - C.F$$