

Exercises :

34. ANOVA table .

$\alpha = 0.05$

Blocks	Treatments			$\bar{x}_{i\cdot}$
	A	B	C	
1	0	9	8	5.67
2	2	6	5	4.33
3	8	15	14	12.33
4	0	18	18	12
5	8	7	8	7.67
$\bar{x}_{\cdot j}$	3.6	11	16.6	$\bar{\bar{x}} = 8.4$

$k=3, b=5, n_T=15$

$$\rightarrow SSTI = \sum_{j=1}^k \sum_{i=1}^b (x_{ij} - \bar{\bar{x}})^2 = (0-8.4)^2 + (9-8.4)^2 + (8-8.4)^2 + \dots =$$

لا تقسم  $x_{ij}$  بعد 15 مرة

$$\rightarrow SSTR = b \sum_{j=1}^k (\bar{x}_{\cdot j} - \bar{\bar{x}})^2 =$$

من مع التكرار

35. Data from randomized block, 5 treatments and 3 blocks.

$SST = 430$ ,  $SSTR = 310$ ,  $SSB = 85$ , set up the ANOVA table and test,  $\alpha = 0.05$ .

Source of variance	df	SS	MS	F
Treatments	$k-1 = 5-1 = 4$	310	$MSTR = \frac{310}{4} = 77.5$	$F = \frac{77.5}{4.38} = 17.7$
Blocks	$b-1 = 3-1 = 2$	85	$MSBL = \frac{85}{2} = 42.5$	
Error	$(k-1)(b-1) = 8$	$430 - 310 - 85 = 35$	$MSE = \frac{35}{8} = 4.38$	
Total	14	430		

NT = 15

Find  $F_{\alpha}$ :

$F_{0.05}$  with  $df_1 = 4$   $df_2 = 8$ .

$F_{0.05} = 3.84 \rightarrow F \geq F_{\alpha}$  so we reject  $H_0$  ( $\alpha = 0.05$ )

36.  $K = 4$ ,  $b = 8$ ,  $\alpha = 0.05$ , complete table.

S.O.V	df	SS	MS	F
Treatments	$k-1 = 4-1 = 3$	900	$MSTR = \frac{900}{3} = 300$	$MSTR = \frac{300}{23.81} = 12.6$
Block	$b-1 = 8-1 = 7$	400	$MSBL = \frac{400}{7} = 57.14$	
Error	$(K-1)(b-1) = 21$	$1800 - 900 - 400 = 500$	$MSE = \frac{500}{21} = 23.81$	
Total	31	1800		

Find  $F_{0.05}$  with  $df_1 = 3$ ,  $df_2 = 21$

$F_{0.05} = 3.07$

$F > F_{\alpha}$  so reject  $H_0$  ( $\alpha = 0.05$ )

## Analyzer

37.

	Car	Comp.	Elec.	$X_{i.}$
$K-1=1$		50	42	46
$b-1=2$	2	55	44	49.5
	3	63	46	54.5
	$X_{.j}$	56	44	<span style="border: 1px solid black; padding: 2px;"><math>50 = \bar{x}</math></span>

$$\text{Now} \rightarrow \text{SST} = \sum \sum (x_{ij} - \bar{x})^2 = (56-50)^2 + (55-50)^2 + (63-50)^2 + (42-50)^2 + (44-50)^2 + (46-50)^2$$

$$= 309$$

$$\rightarrow \text{SSTR} = b \sum_{j=1}^k (x_{.j} - \bar{x})^2 = 3 \left( \frac{(56-50)^2}{36} + \frac{(44-50)^2}{36} \right) = 3(72) = \underline{\underline{216}}$$

$$\rightarrow \text{SSBL} = k \sum_{i=1}^b (x_{i.} - \bar{x})^2 = 2 \left( \frac{(46-50)^2}{16} + \frac{(49.5-50)^2}{0.25} + \frac{(54.5-50)^2}{20.25} \right) = \underline{\underline{73}}$$

$$\rightarrow \text{SSE} = 309 - 216 - 73 = 20$$

$$\bullet \text{MSTR} = \frac{216}{1} = 216$$

$$\bullet \text{MSE} = \frac{20}{2} = 10$$

$$\rightarrow F = \frac{216}{10} = 21.6 \quad \text{with } df_1 = 1, df_2 = 2$$

$$F_{0.05} = 18.51 \rightarrow F > F_{\alpha}$$

so reject  $H_0$  ( $\alpha = 0.05$ )

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