

10. RANDOMIZED BLOCK DESIGN

AIM: To find the ANOVA using RBD to test the null hypotheses against alternative hypotheses with level of significance , $\alpha=0.05$.

1. Four different machines M1, M2, M3 and M4 are being considered for the assembling of a particular product. It was decided that six different operators would be used in a randomized block experiment to compare the machines. The machines were assigned in a random order to each operator. The operation of the machines requires physical dexterity, and it was anticipated that there would be a difference among the operators in the speed with which they operated the machines. The amounts of time (in seconds) required to assemble the product are shown in the table below. Test the hypothesis H_0 at the 0.05 level of significance, that the machines perform at the same mean rate of speed and there is no significance difference between the performances of the operators.

	Operator					
Machine	1	2	3	4	5	6
1	42.5	39.3	39.6	39.9	42.9	43.6
2	39.8	40.1	40.5	42.3	42.5	43.1
3	40.2	40.5	41.3	43.4	44.9	45.1
4	41.3	42.2	43.5	44.2	45.9	42.3

- #Two way anova
- m1<-c(42.5,39.3,39.6,39.9,42.9,43.6)
- m2<-c(39.8,40.1,40.5,42.3,42.5,43.1)
- m3<-c(40.2,40.5,41.3,43.4,44.9,45.1)
- m4<-c(41.3,42.2,43.5,44.2,45.9,42.3)
- data<-data.frame(m1,m2,m3,m4)
- data=t(data)
- time=c(t(as.matrix(data)))
- f=c("Oper1","Oper2","Oper3","Oper4","Oper5","Oper6")
- g=c("M1","M2","M3","M4")
- k=ncol(data)
- n=nrow(data)
- Operators=gl(k,1,n*k,factor(f))
- Machines=gl(n,k,n*k,factor(g))
- anova=aov(time ~ Machines + Operators)
- summary(anova)
-
- interaction.plot(Operators,Machines,time)
- par(mfrow=c(1,2))
- plot(time~Machines+Operators,main="Product time")

2. The following data represents the final marks obtained by five students in Mathematics, English, French and Biology. Test the hypothesis that the courses are of equal difficulty using the p-value in your conclusions and discuss your findings.

	Subject			
Student	Mathematics	English	French	Biology
1	68	57	73	61
2	83	94	91	86
3	72	81	63	59
4	55	73	77	66
5	92	68	75	87