

LAB EXPERIMENT 6

MAT-2001 STATISTICS FOR ENGINEERS

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Slot. - L-15+16

QUESTION 1

1. A firm wishes to compare four programs for training workers to perform a certain manual task. Twenty new employees are randomly assigned to the training programs, with 5 in each program. At the end of the training period, a test is conducted to see how quickly trainees can perform the task. The number of times the task is performed per minute is recorded for each trainee

Program 1	Program 2	Program 3	Program 4
9	10	12	9
12	6	14	8
14	9	11	11
11	9	13	7
13	10	11	8

Calculate and interpret the above one way ANOVA table.

CODE:-

```
> p1=c(9,12,14,11,13)
> p2=c(10,6,9,9,10)
> p3=c(12,14,11,13,11)
> p4=c(9,8,11,7,8)
> df1=data.frame(p1,p2,p3,p4)
> df1
  p1 p2 p3 p4
1  9 10 12  9
2 12  6 14  8
3 14  9 11 11
4 11  9 13  7
5 13 10 11  8
```

```

4 11 9 13 7
5 13 10 11 8
> r=c(c(as.matrix(df1)))
> r
[1] 9 12 14 11 13 10 6 9 9 10 12 14 11 13 11 9 8 11 7 8
> f=c("p1","p2","p3","p4")
> f
[1] "p1" "p2" "p3" "p4"
> k=4
> n=5
> tm = gl(k,1,n*k,factor(f))
> tm
[1] p1 p2 p3 p4 p1 p2 p3 p4 p1 p2 p3 p4 p1 p2 p3 p4 p1 p2 p3 p4
Levels: p1 p2 p3 p4
> crdfit=aov(r~tm)
> summary(crdfit)

      Df Sum Sq Mean Sq F value Pr(>F)
tm      3  4.95  1.650  0.288 0.833
Residuals 16 91.60  5.725

```

Since the p-value of 0.833 is GREATER than the .05 significance level,

We may regard the four programs to be homogeneous

QUESTION 2

2. In a factory producing edible oil and marketing its product in 15 kg tins, uses five filling machines. Random samples of the packed tins were taken for each machine A,B,C,D and E were presented below

A	B	C	D	E
14.85	14.28	14.16	15.25	14.60
15.00	14.42	14.15	15.30	14.84
15.25		14.19	15.10	14.82
15.10		14.50	15.35	14.74
14.80			15.00	

Analysis of data to test the Equality of efficiency of machines .

CODE:-

```
>data=c(14.85,15.00,15.25,15.10,14.80,14.28,14.42,14.16,14.15,14.19,14.50,15.25,15.30,15.10,15.35,15.00,14.60,14.84,14.82,14.74)
```

```
>machines=c("A","A","A","A","A","B","B","C","C","C","C","D","D","D","D","D","E","E","E","E")
```

```
> Anova1=aov(data~machines)
```

```
> summary(Anova1)
```

```
      Df Sum Sq Mean Sq F value Pr(>F)
```

```
machines    4 2.6205  0.6551  28.11 8.18e-07 ***
```

```
Residuals 15 0.3496  0.0233
```

Since the p-value of is GREATER than the .05 significance level.

Hence, we accept the null hypothesis that the mean efficiency of machines are all equal.