HW 16 Problem 22

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22. The table for this question has 7 treatments with 10 samples in each. The following is the output for the code available on Canvas.

```
t1 <- stack(tabs)
t2 <- aov(values~ind,data=t1)

summary(t2)
```

```
##             Df Sum Sq  Mean Sq F value   Pr(>F)
## ind          6 0.1534 0.025572    11.9 6.97e-09 ***
## Residuals   63 0.1354 0.002149
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
TukeyHSD(t2)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = values ~ ind, data = t1)
##
## $ind
##              diff          lwr          upr     p adj
## Lab2-Lab1 -0.041 -0.104134026  0.022134026 0.4386680
## Lab3-Lab1 -0.002 -0.065134026  0.061134026 0.9999999
## Lab4-Lab1  0.062 -0.001134026  0.125134026 0.0574768
## Lab5-Lab1  0.111  0.047865974  0.174134026 0.0000257
## Lab6-Lab1  0.056 -0.007134026  0.119134026 0.1148068
## Lab7-Lab1  0.043 -0.020134026  0.106134026 0.3802960
## Lab3-Lab2  0.039 -0.024134026  0.102134026 0.4999816
## Lab4-Lab2  0.103  0.039865974  0.166134026 0.0001075
## Lab5-Lab2  0.152  0.088865974  0.215134026 0.0000000
## Lab6-Lab2  0.097  0.033865974  0.160134026 0.0003045
## Lab7-Lab2  0.084  0.020865974  0.147134026 0.0025843
## Lab4-Lab3  0.064  0.000865974  0.127134026 0.0448745
## Lab5-Lab3  0.113  0.049865974  0.176134026 0.0000179
## Lab6-Lab3  0.058 -0.005134026  0.121134026 0.0919678
## Lab7-Lab3  0.045 -0.018134026  0.108134026 0.3258596
## Lab5-Lab4  0.049 -0.014134026  0.112134026 0.2313037
## Lab6-Lab4 -0.006 -0.069134026  0.057134026 0.9999481
```

```
## Lab7-Lab4 -0.019 -0.082134026  0.044134026 0.9685541
## Lab6-Lab5 -0.055 -0.118134026  0.008134026 0.1278284
## Lab7-Lab5 -0.068 -0.131134026 -0.004865974 0.0267260
## Lab7-Lab6 -0.013 -0.076134026  0.050134026 0.9956598
```

The above output suggest the following:

The Analysis of Variance (AOV) table indicates that there is very strong evidence to suggest that one of the differential effects (α_i) for $i = \{1, ..., 7\}$ is not equal to the others.

The Tukey function output indicates that the means of the following treatments are significantly different:

- Lab 1 with Lab 5.
- Lab 2 with Lab 4.
- Lab 2 with Lab 5.
- Lab 2 with Lab 6.
- Lab 2 with Lab 7.
- Lab3 with Lab 5.

The function also indicates that the following treatments have weak evidence that their means are different:

1. Lab 1 and Lab 4.
2. Lab3 and Lab 4.
3. Lab 5 and Lab 7.