# CRD/One-Way ANOVA and Multiple Comparisons in R

*Do the following assignment in R. Upload a link to an html page and a pdf of your answers in Blackboard*

1. Suppose we wish to design a new experiment that tests for a significant difference between the mean effective life of these 4 insulating fluids at an accelerated load of 35kV. The variance of fluid life is estimated to be 4.5hrs based on preliminary data. We would like this test to have a type 1 error probability of 0.05, and for this test to have an 80% probability of rejecting the assumption that the mean life of all the fluids are the same if there is a difference greater than 1 hour between the mean lives of the fluids.
   1. How many samples of each fluid will need to be collected to achieve this design criterion?
   2. Suppose we wish to have an 80% probability of detecting a difference between mean fluid lives of 30minutes, how many samples would need to be collected?
2. The effective life of insulating fluids at an accelerated load of 35kV is being studied. Test data have been obtained for the four types of fluid. The data from this experiment is given below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Fluid Type | Life (in hr) at 35kV Load | | | | | |
| 1 | 17.6 | 18.9 | 16.3 | 17.4 | 20.1 | 21.6 |
| 2 | 16.9 | 15.3 | 18.6 | 17.1 | 19.5 | 20.3 |
| 3 | 21.4 | 23.6 | 19.4 | 18.5 | 20.5 | 22.3 |
| 4 | 19.3 | 21.1 | 16.9 | 17.5 | 18.3 | 19.8 |

* 1. Given that n=6 samples of each fluid type were collected, with what power will a hypothesis test with an α=0.10 level of significance be able to detect a difference of 1 hour between the mean lives of the tested fluids?
  2. Test the hypothesis that the life of fluids is the same against the alternative that they differ at an α=0.10 level of significance (Remember to enter the data in a tidy format when using R, or to pivot\_longer to a tidy format using tidyr )
  3. Is the model adequate? (show plots and comment)
  4. Assuming the null hypothesis in question 1 is rejected, which fluids significant differ using a familywise error rate of α=0.10 (use Tukey’s test). Include the plot of confidence intervals.