MEEN 689 DoE and Data Analytics for MEENers

Homework Assignment 3 Topics 6 (60 points)

Due 09/19/2024 through Canvas

Datasets are included in the Excel file: HW3data.xlsx

1. **[20 pts]** Excel Sheet Q1 contains data for a two-variable, full factorial experiment with 2 replications for each condition. Answer the following questions:
   - **a.** Plot the results (as those shown in slides) using the average of 2 replication for each condition.
   - **b.** Run 2-way ANOVA with interaction and list the result
   - **c.** Conclude your 2-way ANOVA statistically
   - **d.** Now, try to run 2-way ANOVA without interaction and list the result
   - **e.** Do you still get the same conclusion? Why or Why not?

2. **[20 pts]** You are to design a two-variable experiment (Fertilizer and Water amount) and see how they affect the flow growth (cm). Because of potential soil-to-soil variation, the experiment is intentionally conducted in three areas (blocks) of soils. The data is listed in Excel Sheet Q2, note that Water Amount is measured in numbers.
   a. Conduct two-way ANOVA with blocking and list your result
   b. Conclude the effect of Fertilizer and Water Amount statistically
   c. Is there any interaction between the two variables?
   d. Is there any effect of the blocking variable (Soil)?
   e. Would running regular 2-way ANOVA return (no blocking) the same conclusions?

3. **[20 pts]** Excel Sheet Q3 contains data for a 3-variable, full factorial experiment. Answer the following questions:
   - **a.** Name this full factorial experiment (e.g., 1 x 2 x 2 or something else)
   - **b.** Run 3-way ANOVA including all possible interactions
   - **c.** Conclude your results statistically
   - **d.** From Part b, you may notice a few insignificant terms (p-value > 0.05). Should you remove them and run ANOVA again to obtain the result? Explain. (you may need to do some literature search for this question)