Question 1: Plackett-Burman

⋆ Given

A gold placer mining operation in the Klondike is operating a complex wash plant / sluice system. The claim owner wants to determine the key factors that drive the final gold output. There are 28 factors he would like tested. You have interested him in a Plackett-Burman design. Answer his following questions:

1. How many different settings selections [aka runs] are required?
2. Is there anyway without reducing the number of factors tested, to reduce the number of times the slice gate angle is changed; as it is an all day event?

He seems a bit irritated with your answer to #1. Explain to him how, if he is willing to drop one factor, you can modify the PB design significantly? If each run costs $50,000 to complete, show how much money he can save.

⋆ Solution

Question 2: Star Points

⋆ Given

- A: Speed of Cutting Blade [2000rpm, 5000rpm]
- B: Negative Pressure Environmental Vacuum [-1atm, -2atm]
- D: Duty Cycle of Cutting Blade [2 min on 3 min off, 4 min on 1 min off]

⋆ Find

What are the actual values needed to be tested at the α (star points) for a CCC in the above?

⋆ Solution

Question 3: RSM

⋆ Given

Given a first pass experiment [2^2 BFFE with two center points] resulted in the following model equation:

$$\hat{y} = -35.9 + 2.52x_1 - 6.42x_2 + 2.35x_1x_2$$

⋆ Find

1. What should be the next 4 points tested?
2. After locating and setting up a secondary experiment the following was determined to be an viable model

$$\hat{y} = 70.549 + 2.326w_1 - 5.771w_1w_2 - 4.781{w_1}^2 + 3.062{w_2}^2$$

The junior engineer deleted the regression model. Determine if there is a stationary point within this range and what it is, if it exists. [You do not to say what kind it is]

⋆ Solution

Question 4: Putting it All Together

Using an example of a complex situation where there have been 15 factors identified that could impact the output response. Explain the process you would follow in designing an experiment to evaluate and address that situation in terms of identifying and optimizing the critical factors and interaction to maximize the response value. Include in your discussion the use of the following techniques/terms we have studied this term.

- Type I Error
- Level of Significance
- ANOVA
- Regression
- Factorial Experiments
- Fractional Factorial Experiments
- Randomization
- F Value
- Adjusted r^2
- Generators/Defining Words
- Aliasing/Resolution
- Interaction Plots
- Tukey Test/Plots
- FrF2 Package
- Design Matrix

Question 5: Simulation

As shown in class, run the simulation `runGitHub('DoE','IkeEisenhauer',subdir='001-Simulation_001')`

1. Use the techniques learned in class to get settings required to achieve at least 45 in the response
2. Document your rationale for each step of your process
3. Confirm your settings with a 50 experimental sample run set that has an average above 45

Remember you need to have `shiny` and `shinydashboard` installed and loaded for the simulation to work

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END OF ASSIGNMENT