STAT 321: HW / Handout 6 & 7 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
Spring 2018
Points: 30 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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An experiment was conducted to better understand a process of filling bottles of a specified liquid. Factors that are believed to influence the filling process are: A: carbonation, B: operating pressure in the filler machine, and C: line speed as measured by bottles processed per minute. The response is the amount of deviation from the optimal fill level.

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| Factors | Response |  |

|  |  |  |
| --- | --- | --- |
| Factors | Low Setting | High Setting |
| A: Carbonation (%) | 10% | 12% |
| B: Pressure (psi) | 25 | 30 |
| C: Speed (b/m) | 200 | 250 |
|  |
| Response: Deviation (oz) | Deviation from optimal fill level |

 |
| A | B | C | Rep 1, Rep 2 |
| - | - | - | -3, -1 |
| + | - | - | 0, 1 |
| - | + | - | -1, 0 |
| + | + | - | 2, 3 |
| - | - | + | -1, 0 |
| + | - | + | 2, 1 |
| - | + | + | 1, 1 |
| + | + | + | 6, 5 |

1. Create a 23 design in Minitab with 2 replicates. Setup the design using the factor level specifications provided above. Enter the data into Minitab. (3 pts)

Provide a screen-shot of your design with data included.

1. Determine the factors that are statistically important to the response variable. (6 pts)

Provide a screen-shot of your p-value output along with an appropriate discussion.

1. Conduct a quick review of the residual plots. Are there any unusual observations? Do you see any issues in these plots? Discuss. (3 pts)

Provide the residuals plots and your discussion.

1. Create the relevant plots for the effects that are deemed statistically important, i.e. any interaction plots or main effect plots. Briefly discuss. (4 pts)

Provide plot(s) and discuss.

1. Create a Cube Plot for your analysis. Briefly discuss how the important effects are evident in this plot. (3 pts)

Provide plot(s) and discuss.

1. Create two contour plots 1) Hold the level of Factor A at the low level and create a contour plot for Factors B and C, 2) Hold the level of Factor A at the high level and create a contour plot for Factors B and C. If the goal is a response value near 0, specify a couple optimal settings for Factors A, B, and C. (4 pts)

Provide plot(s) and discuss.

1. Using the big ugly regression equation provided in Minitab, verify the Fitted Means for 10% carbonation, 30 psi of pressure and 250 bottles per minute. That is, do the math and show me that it matches one of the appropriate Fitted Mean value obtained by Minitab. (3 pts)

Show the math for obtain the Fitted Mean value.

1. Using the Response Optimizer in Minitab, determine the optimal setting to produce a target value of 0 for the response, i.e. no deviation from optimal filling level. (3 pts)

Provide screen shot of optimal setting as determined by Minitab.