Stat 541 Homework #6 Due: Friday, March 24, 2017

1. (2pt) Problem 4-46 on page 182.

2. (1pt) Problem 4-49 on page 182.

3. In the early stages of processing, natural fiber (such as cotton and wool) require cleaning. A textile specialist investigated 4 cleaning processes for wool. Because different batches of wool are received are received from different ranches, batches were taken to be blocks. Wool from 8 batches was obtained. The wool from each batch was thoroughly mixed and divided into 3 sub-batches. The following BIBD was run. The measured response was the loss in weight (in mg) after cleaning and drying.

Batch	Agent / Weight Loss					
1	A	24.3	B	23.8	C	21.5
2	A	21.0	B	18.8	D	18.2
3	A	24.1	C	20.1	D	22.2
4	B	25.2	C	23.5	D	20.5
5	A	19.8	B	21.8	C	17.2
6	A	23.8	B	21.7	D	20.8
7	A	22.9	C	17.3	D	18.0
8	B	21.3	C	20.2	D	19.8

   (a) (1.5pt) What are the values of k, r, a, b, and λ?

   (b) (5.5pt) Analyze this data. Including the ANOVA table, residual plots and values, the least squares means of the 4 cleaning processes, and the least squares estimates $\widehat{\tau}_1$, $\widehat{\tau}_2$, $\widehat{\tau}_3$, and $\widehat{\tau}_4$.

   (c) (2pt) The following table contains a table of pairwise comparisons of the least squares means. Each p-value comes from t-tests and is not adjusted for the number of pairwise comparisons. Based on these p-values and using $\alpha = .05$, perform the Bonferroni multiple comparison procedure.

Least Squares Means for Effect agent
t for H0: LSMean(i)=LSMean(j) / Pr > |t|

Dependent Variable: wgtloss

i/j	1	2	3	4
1		1.353538	4.668849	4.394715
		0.1990	0.0004	0.0007
2	-1.35354		3.315311	3.041177
	0.1990		0.0056	0.0095
3	-4.66885	-3.31531		-0.27413
	0.0004	0.0056		0.7883
4	-4.39472	-3.04118	0.274134	
	0.0007	0.0095	0.7883	

4. (8pt) Using the data from Problem 5.10 (page 226):

   (a) Answer parts (a) and (c) only. You can assume both factors are fixed. Also state the hypotheses to be tested

   (b) Provide estimates of the model effects assuming textbook constraints (sum of effects = 0).

   (c) Use an interaction plot to describe the relationship between the response and the design variables (glass type and temperature).

   (d) Perform a Tukey multiple comparison procedure comparing the means for all pairs of glass type and temperature combinations.

5. (3pt) **For Stat 541 Students;** Problem 4-50 on page 182. You need to assume the basic model assumptions of the independence of observations and the homogeneity of variance.

6. (3pt) **For Stat 541 students**: Each of the following tables represents the cell means from a balanced 2×2 factorial completely randomized design with n replicates per cell. For each table tell which of the following sums of squares (if any) would be zero for that table: SS_A, SS_B, SS_{AB}. There may be more than one.

Table 1

		Factor A	
Factor B		4	7
		4	4

Table 2

		Factor A	
Factor B		5	6
		5	4

Table 3

		Factor A	
Factor B		1	3
		5	7

Table 4

		Factor A	
Factor B		6	4
		6	4

Table 5

		Factor A	
Factor B		2	8
		8	2