STAT 512

Homework 10 (23 pts. + 1.5 pt. Bonus) due April 11

A reminder – Please do not hand in any unlabeled or unedited SAS output. Include in your write-up only those results that are necessary to present a complete solution (what you want the grader to grade). In particular, questions must be answered in order (including graphs), and all graphs must be fully labeled (main title should include the question number, and all axes should be labeled). Don't forget to put all necessary information (see course policies) on the first page. Include the SAS input for all questions at the very end of your homework; this could be important even though it won't be graded. You will often be asked to continue problems on successive homework assignments so save all your SAS code.

- 1. (2 pts.) This is based on Problem 19.5 in the textbook. (This is a SAS problem; however, you will have to code in the data yourself.)
 - (a) Present a table that contains the means for the factor B main effects.
 - (b) Create a interaction plot where the x-axis is for factor B. From this plot, is there an interaction between factor A and factor B? Are these interactions important? Please explain your answer.
- 2. (21 pts.) This question uses the disk drive data in 19.16 (CH19PR16.DAT) in the textbook.
 - (a) Present a table of sample sizes, means, and standard deviations for the nine different treatment combinations. What are the values for the cell means parameters?
 - (b) Write the factor effects model for this analysis, and
 - i. estimate the parameters of this model under the zero-sum constraint system (conceptual). Perform the estimates in the following two ways. You only need to confirm the constraints once.
 - 1. using the output of the means statement and a calculator (be sure to show your work).
 - 2. using repeated calls to proc glm (see sample code from the web site).
 - ii. estimate the parameters of this model under the SAS constraint system. Be sure to show that your estimates satisfy the constraints using proc glm (see sample code from the web site).
 - (c) Make an interaction plot of the cell means with the level for the technician on the x-axis. Use a different type of line for each make of drive. Describe the plot in terms of main and interaction effects.
 - (d) Perform the two-way analysis of variance for this data set. State the null and alternative hypothesis for the interaction effects and for each main effect and in terms of the factor effects model. For set of hypotheses, give the test statistic with degrees of freedom, pvalue, the decision and your conclusion in words. Is it appropriate to examine the individual factors in more detail here? Please explain your answer. Note: Please include the examination of the individual factors no matter what your answer is.
 - (e) Check the assumptions of the ANOVA model using the 'standard plots'. Draw an overall conclusion regarding the validity of the conclusions that you presented in part c) above.

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- (f) Please calculate the following 95% confidence intervals by hand for the minutes required for service using data obtained from SAS for the following situations: (Note: you will have to calculate the confidence intervals using a calculator.) Note: Parts ii), iii) and iv) are multiple comparisons; part i) is NOT a multiple comparison. [Note: you will be able to code parts ii, iii, and iv after lecture on Tuesday.}
 - i. technician 1, make of drive 3
 - ii. The contrast to determine if the average of technician 1 and technician 3 is the same as technician 2 when they are all servicing make 1. Indicate whether these two averages are the same and explain your choice.
 - iii. The contrast to determine if the average of make 1 and make 2 is the same as make 3 when they are all serviced by technician 3. Indicate whether these two averages are the same and explain your choice.
 - iv. BONUS: (1 pt.) The contrast to determine of the average of make 1 and 2 is the same for technician 3 as the average of make 1 and 3 is for technician 1. Indicate whether these two averages are the same and explain your choice.