STAT 512 Midterm Exam 2 July 29 2005

Name:

Show your work. You might get some partial credit for it. All questions are for five points.

GOOD LUCK !!!

1. For a one-way ANOVA with three groups the sample sizes are 10, 18 and 20 and the corresponding estimators of variance are 20, 25 and 30. Estimate the variance of the error term in your model.

2. For a one-way ANOVA with three groups MSE=10, n_1=10, n_2=15, n_3=20. SAS parameter estimators are μ=30, α_1=7, α_2=3.

    a) Find the average value of the response for each level of the factor.

    b) Find 95 % confidence interval for μ_2.

c) Use the Bonferroni correction and construct confidence intervals for μ_1, μ_2 and μ_3 in such a way that the probability that all μ's fall inside their intervals is not smaller than 95 %.

d) Test the hypothesis that $\mu_2 = \frac{\mu_1 + 2\mu_3}{3}$.

3. Below you have a part of TYPE I SS table for 4*4 design with 3 observations per each cell.

	df	SS
A		150
B		100
A*B		
Error		100
Total		400

a) Fill in the numbers of degrees of freedom.
b) Find the estimator of the standard deviation of the error term.

c) Test the hypothesis that there are no interactions (give the value of the test statistic, number of degrees of freedom, critical value and your conclusion).

d) Test the hypothesis that none of the factors influences the response (give the value of the test statistic, number of degrees of freedom, critical value and your conclusion).

4. The Levene test for your ANOVA data rejects the null hypothesis. What does it mean ? What can you do to solve this problem ?

5. Below you have a part of the output from PROC GLM for a balanced design.

The GLM Procedure

Dependent Variable: Y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	1078.533333	215.706667	7.44	<.0001
Error	54	1564.800000	28.977778		
Corrected Total	59	2643.333333			

Source	DF	Type I SS	Mean Square	F Value	Pr > F
A	1	209.0666667	209.0666667	7.21	0.0096
B	2	760.4333333	380.2166667	13.12	<.0001
A*B	2	109.0333333	54.5166667	1.88	0.1622

Tukey Grouping	Mean	N	B
A	11.050	20	3
B	5.500	20	2
B			
B	2.450	20	1

a) Write the factor effects model for this analysis. Give the number of levels for each factor and number of observations per each group.

b) Give the estimate of the variance of the error term.

c) Which effects are statistically significant ?

d) Interpret the results of the Tukey procedure.

e) You decided to drop interactions from your model. Give the estimator of the variance of the error term in the model without interaction.

f) Perform a ONE WAY ANOVA test for a significance of A factor (give the value of the test statistic, number of degrees of freedom, critical value and your conclusion).