Homework 32, STAT 514, Due 09/24/09

Instruction: You can use SAS or any software to get any information you need (such as the sample means, MSE, p-value, etc). Please attach the computer output and number each page. You should make reference to the output (e.g., see page ** in the attached SAS output). However, you must answer each question explicitly, and should not write your answer on the output.

1. Consider the Reaction Time Experiment (p. 98).
   a. Write down a one-way ANOVA model for this experiment. Explain each of model items.
   b. Test the hypothesis that the treatments do not have different effects on the reaction time.
   c. Consider the following contrasts: $\mu_2 - \mu_1, \mu_3 - \mu_1, \mu_3 - \mu_2$, where μ_i represents the ith treatment mean. How do you interpret each contrast using the plain language?
   d. What methods (Bonferroni, Tukey, Dunnett or Scheffe) are applicable for constructing simultaneous confidence intervals for the contrasts in c? What method(s) is not appropriate?
   e. For each appropriate method you identified in d, construct a set of 95% simultaneous confidence intervals (SCIs). What can you conclude from the SCIs in terms of the differences of treatment means? Which method gives shortest SCIs?
2. For the Reaction Time Experiment, consider the following contrasts
   $\mu_2 - \mu_1, \mu_3 - \mu_1, \frac{\mu_2+\mu_3}{2} - \mu_1$.
   a. What methods (Bonferroni, Tukey, Dunnett or Scheffe) are applicable for constructing simultaneous confidence intervals for the contrasts in c? What method(s) is not appropriate?
   b. For each appropriate method you identified in d, construct a set of 95% simultaneous confidence intervals (SCIs). Which method gives shorter SCIs?
3. For the Reaction Time Experiment, find a 95% confidence interval for $\frac{\mu_1+\mu_4}{2} - \frac{\mu_2+\mu_5}{2}$.
4. For the Reaction Time Experiment, consider testing the hypotheses
   $$H_0: \frac{\mu_1 + \mu_4}{2} - \frac{\mu_2 + \mu_5}{2} = 0, against\ H_1 :: \frac{\mu_1 + \mu_4}{2} - \frac{\mu_2 + \mu_5}{2} < 0$$
   Find the p-value of the test and make a conclusion (reject H_0 or fail to reject H_0) for the significance level $\alpha = 0.05$.