HW 3- ANOVA

1. (Data in file softdrink.txt) A soft-drink manufacturer uses five agents (1, 2, 3, 4, 5) to handle the premium distributions for its various products. The marketing director desired to study the timeliness with which the premiums are distributed. Twenty transactions for each agent were selected at random and the time lapse (in days) for handling each transaction was determined. Assume the one way anova model is appropriate.

   (a) (2pt) Obtain the analysis of variance table and test whether or not the mean time lapse differs for the five agents. Use $\alpha = 0.05$.

   what is the paired comparison plot?(b) (2pt) Test for all pairs of factor level means whether or not they differ using the Tukey procedure with $\alpha = 0.05$. Set up groups of factor levels whose means do not differ. Use a paired comparison plot to summarize the results.

   (c) (2pt)The marketing director wishes to compare the mean time lapses for agents 1, 3 and 5. Obtain the pairwise confidence interval for all pairwise comparisons among these three treatment means using the Bonferroni procedure with a 90% family confidence coefficient. Interpret your result.

   (d) (2pt) Agents 1 and 2 distribute merchandise only, agents 3 and 4 distribute cash-value coupons only and agent 5 distributes both merchandise and coupons. Estimate the contrast
   $$L = \frac{\mu_1 + \mu_2}{2} - \frac{\mu_3 + \mu_4}{2}$$
   using a 95% confidence interval. Interpret your result.

   (e) (2pt) Estimate the following comparisons with a 95% confidence interval using the Bonferroni method
   $$L_1 = \mu_1 - \mu_2, L_2 = \frac{\mu_1 + \mu_2}{2} - \mu_5, L_3 = \frac{\mu_3 + \mu_4}{2} - \mu_5.$$

   (f) (2pt) Of all premium distributions, 25% are handled by agent 1, 20% are handled by agent 2, 20% are handled by agent 3 , 20% are handled by agent 4 and 15% are handled by agent 5. Estimate the overall mean time lapse for premium distributions with a 95% confidence interval.

2. A research laboratory was developing a new compound for the relief of severe cases of hay fever. In an experiment with 36 volunteers, the amount of the two active ingredients (factors A and B) in the compound were varied are three levels each. Randomization was used in assigning four volunteers the the nine treatments. The data on hours of relief is in the file (hay.tx).

   (a) (2pt) Construct an interaction plot. Does it suggest that that there is an interaction between A and B? Test whether or not the two factor interact using $\alpha = 0.05$. What is the p-value of this test?

(b) (2pt) Fit the model without the interaction and test whether the effects of the two factors are present. Use $\alpha = 0.05$.

(c) (2pt) Assume that the model with the interaction is appropriate and construct a 95% confidence interval for μ_{23}.

(d) (2pt) Assume that the model with the interaction is appropriate, estimate $L = \mu_{12} - \mu_{11}$ with a 95% confidence interval. Interpret your result.