Homework 8

STAT 514

The cigarette experiment described on page 760. It was run to determine the factors that affect the length of time that a cigarette will burn. There were three factors of interest: - "Tar" (factor A) at two levels, "regular" and "ultra-light,"' - "Brand" (factor B) at two levels, "name brand" and "generic brand" (coded 1 and 2), - "Age" (factor C) at three levels, "fresh," " 24 hour air exposure," "48 hour air exposure."

The cigarettes were to be burned in whole plots of size six. This was to help with the difficulty of recording burning times and to help keep the amount of smoke in the room at a reasonable level. There were ten whole plots, and these were assigned at random to the tar levels so that each tar level was assigned five whole plots.

The six split plots (time slots) in each whole plot were assigned at random to the six brand/age treatment combinations. Marks were made across the seam of each cigarette at a given distance apart. Each cigarette was lit at the beginning of its allotted time slot, and the time taken to burn between the two marks was recorded. The data can be downloaded at https://www.stat.purdue.edu/~zhanghao/STAT514/Data/cigarettet.txt. Note that factor D is created to denote the combination of factors B and C.

Answer the following questions by attaching the SAS code and relevant SAS output.

1. Ignore Factors B and C and only consider factor A (assigned to whole plots) and factor D (assigned to the split-plots). Write SAS code for the analysis of this split-plot design and test the hypothesis that factor A has no effects on the burning time. State the p-value and your conclusion.

2. Now the experimenters like to investigate the interaction effects of factors B and C. Run the analysis for a model that includes all two-way interaction terms and the thee-way interaction term. State your conclusion about the interaction effects of factors B and C.

3. Provide 95% simultaneous confidence intervals for all pairwise comparison of main effects of factor B using Tukey's method.