Homework 3

1. Permute the last two rows of the data and factor labels in Problem 4.19 so that the experiment is balanced for residual effects. Construct a model that tests for residual effects (I would like to see your SAS source code). Are residual effects present?

2. Prove that the choice of $\alpha_1$ that minimizes the variance of $\alpha_1 \hat{\tau} + (1 - \alpha_1) \tilde{\tau}$

   is

   \[
   \frac{1}{\frac{1}{V(\tau)} + \frac{1}{V(\tilde{\tau})}}
   \]

   Note that $\alpha_2$ in the book is equal to $1 - \alpha_1$.

3. Problems 4.33, 4-39 (BIBD). Find optimal $\alpha_1$. Compute combined estimators for $\tau_1, \ldots, \tau_7$. 
