STAT 516 – Homework 6 – Due: Monday, April 6th

Questions 1-6 use the following setting - Seven different types of material (labeled A-G) were sent out to a sample of 13 laboratories for stress testing (since different laboratories use different testing methods), with four copies of each sample being sent to each lab. The following `PROC GLM` code used was:

```
PROC GLM;
CLASS lab material;
MODEL stress = lab material lab*material;
RANDOM lab lab*material;
RUN;
```

And the output was:

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	90	322913.2482	3587.9250	177.01	<.0001
Error	273	5533.5800	20.2695		
Corrected Total	363	328446.8282			

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lab	12	30328.0547	2527.3379	124.69	<.0001
material	6	268778.0771	44796.3462	2210.03	<.0001
lab*material	72	23807.1165	330.6544	16.31	<.0001

Source	Type III Expected Mean Square
lab	Var(Error) + 4 Var(lab*material) + 28 Var(lab)
material	Var(Error) + 4 Var(lab*material) + Q(material)
lab*material	Var(Error) + 4 Var(lab*material)

1) What null hypothesis is being tested by the `lab` line in the Type III table (the F-value of 124.69).

2) Find the value of the F statistic for testing that $\sigma^2_{lab} = 0$ against $\sigma^2_{lab} > 0$, and test that hypothesis at the $\alpha = 0.05$ level. (A web-page for calculating F-critical values can be found at `www.biokin.com/tools/fcrit.html`).

3) Find an estimate of σ^2_{lab} by estimating the E(MS) with the MS values from the ANOVA table and Type III table.

4) Consider making the assumption that there is no interaction in the above example. Compute all of the values that we would have gotten for that ANOVA table (the Model, Error, and Corrected Total lines) including the SS, df, MS, F-statistics, and p-value. (A web-page for calculating F p-values can be found at `http://www.danielsoper.com/statcalc/calc07.aspx`).

5) In this example we can test the assumption of no interaction because we have replications (the Type III test would do it!) How would you check the assumption of no interactions in the case where we have no replications?

6) Consider coding the seven types of materials (A-G) using dummy variables. How many variables would you need to use, and what would they be?

7) Complete the 4x4 Latin Square shown at the right:

A	B	D	C
D	C	A	B
B	D	C	___
___	___	___	___