Review for FINAL EXAM - STAT 642 - Spring 2015

Local Students - Monday, May 11, 10:30 a.m. - 12:45 p.m. - Room 411 Blocker

Distance Students - Monday, May 11, 1:00 p.m. CDT - Tuesday, May 12, 1:00 p.m. CDT

Instructions:

(1) You will have 2 Hours and 15 minutes to complete the Final Exam.

(2) You may use the following:

- Tables - You may use **ONLY the Tables** provided with the exam
- Calculator - Your device cannot facilitate a connection to the internet or emailing or texting.
- Summary Sheets - (**7-pages,** $8.5^{"}$**x**$11^{"}$**, you may write on both sides of the 7 pages**)

(3) Do not use your textbook other than tables, class notes, or any other written material except for the summary sheets.

(4) Do not use a computer, cell phone, or any other electronic device.

Topics Covered on EXAM:

1. Every designed experiment has the following three components:
   - C_1- Randomization - Completely Randomized, Blocked, Latin Squares, Random Factor Levels, Subsampling, Incomplete Blocks, Split-Plot, Split-Split-Plot, Strip-Plot, Crossover, Repeated Measures
   - C_2- Treatment Structure - Single Factor, Crossed, Fractionally Crossed, Nested

     Factor Levels - Fixed, Random
   - C_3- Measurement Structure - Single measurement, Subsampling, Repeated Measures
2. Given the description of an experiment:

   a. Identify the three components in a designed experiment
   b. Write a model relating the response to the factor effects: both cell means and effects models
   c. Provide a complete description of all terms in the model, both constraints and distributional assumptions.
   d. Provide an appropriate AOV including expected mean squares
   e. Provide appropriate F-statistic including d.f.(approx. if necessary using Sattherwaite Approximation Procedure)
   f. Estimate all variance components
   g. Provide the the estimated standard errors of the differences in treatment means
   h. Compute the value of the Tukey-Kramer HSD statistic

i. Provide an appropriate contrast to test specified linear combinations of treatment means

3. In a factorial experiment involving missing treatments, specify contrasts in the observed treatment means which can be expressed as main-type effects and interaction-type effects and provide the appropriate test statistics. State whether your contrast is estimable or not.

4. In an experiment with a mixture of fixed and random factor levels, and crossed and nested factor effects; determine the appropriate methods of analysis of the factors: multiple comparison, contrast, variance components. Be able to express the formula for HSD and Dunnett for comparing differences in treatment means, and for a F-test of contrasts.

5. Describe how to assign treatments to EU's in the various designs we discussed in class.

6. Determine sample sizes, relative efficiency, and power curves for the various designs we discussed in class.

7. Assessment of Model Assumptions

    a. Normality - Residual Plots and Sharpiro-Wilks Test
    b. Equal Variances - Residual Plots and BFL Test
    c. Independence - Residual Plots and Runs Test
    d. Outliers - Studentized Residual Plots

8. Alternative Approaches when Model Assumptions are Violated

    a. Normality - Transformations or Kruskal-Wallis or Friedman Ranks Test or GLIM
    b. Equal Variances - Transformations or Weighted Least Squares or GLIM
    c. Independence - Specify Correlation Structure in Model

9. Be able to express models in matrix form: $\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{e}$ both with and without constraints on the parameters.

10. Given the generators in a fractional factorial design,

    a. Specify the selected treatments
    b. Determine the alias sets
    c. Determine the resolution of the design
    d. Determine the important effects (main and/or interactions) when $df_{Error} = 0$

11. In experiments involving more than one measurement per EU, specify the type of measurement process:

    a. Subsampling
    b. Repeated Measures - longitudinal
    c. Repeated Measures - spatial
    d. Crossover