Applied Statistics Qualifying Exam

The exam consists of a 3-hour written exam (closed book, closed notes, no computer, no calculator) and a 24-hour take-home portion to perform statistical analysis on real datasets.

Detailed Syllabus:

1. Ordinary linear regression models
    a. Ordinary least squares and maximum likelihood estimators
    b. Simple and multiple linear regression model in matrix form
    c. Multiple regression with polynomial and qualitative predictors.
    d. Inference about parameters, simultaneous confidence intervals
    e. Predicting a new observation
    f. ANOVA and F tests, model building, and model validation
    g. Diagnostics and remedial measures, graphical diagnostics, tests for assumptions, lack of fit test, multicollinearity, transformations of variables
2. Multivariate normal distribution and its properties
3. Multivariate linear regression models
4. Principal component analysis
5. Statistical Learning
    a. Classification methods, logistic regression, linear discriminant analysis
    b. Clustering methods
    c. Assessing model accuracy, cross-validation
    d. Ridge Regression and LASSO

Materials are from STAT 425 and STAT 426, and can be found in:

- Applied Linear Regression Models by Kutner, Nachtsheim, and Neter
- An Introduction to Statistical Learning with Applications in R by James, Witten, Hastie, and Tibshirani
- The Elements of Statistical Learning by Hastie, Tibshirani, and Friedman
- Applied Multivariate Statistical Analysis by Johnson and Wichern