What to Review for the Final Exam

Some of the exam problems/questions will be relatively straightforward (particularly if you use the review material that I provide and study the right things), and for other problems you'll need to "keep your wits about you" and give them a bit of thought before plunging in. There will be some true/false and multiple choice problems, and also some problems for which you'll need to do (and show) some work to arrive at the answers. None of the problems require heavy-duty computation. (I.e., you won't have to do anything like an ANOVA F test starting from samples of data values. See the old exams I'm giving you to get an idea of what sort of problems that I consider to be reasonable.) Calculators and/or computers are allowed (in addition to whatever books and notes you want to bring), and I suspect that you'll want at least a calculator that will do binomial coefficients (combinations) and powers in addition to standard low-level tasks, but I don't believe that you'll have any great advantage having a computer with Minitab, Maple, or some other software on it. (It might be a good idea to spend some time familiarizing yourself with the tables associated with the material emphasized in the review guidelines below.) I think that you'll be rewarded for (a) studying the specific things indicated on this review sheet (and other hints that I may give on the course web site) and getting comfortable with this material, and (b) having obtained some depth of understanding as you've gone through this course (as opposed to having merely hastily done the homework assignments without giving a lot of thought to the whole body of material that was presented).

Specific Things to Study From the Class Notes

Obviously, the final cannot cover all of the items listed below. But if you have a good understanding of this matrial, I suspect that you can do decently on the exam, since the majority of the problems that you'll encounter will be related to the items below.

p. 16 The figure showing relationships between type I and type II errors and the true state of nature.

pp. 18-19 The size of a test.

pp. 20-21 Definition of p-value; relationship between p-value and the size of a test.

p. 25 Normal approximation with continuity correction to the binomial distribution.

pp. 37-40 More on p-values.

pp. 54-56 Confidence intervals; relationship between a size α test and a confidence interval having coverage probability $1 - \alpha$.

pp. 79-80 Derivation of simplest form of approximate confidence interval for p.

pp. 118-121 The sign test: it's rationale and the test statistic's sampling distribution under the null and alternative hypotheses.

pp. 179-183 The derivation of the z and t confidence intervals for the difference in two means.

pp. 192-195 The general two-sample problem (shift model; scale model; stochastically larger / stochastically smaller; the comment about the W-W runs test).

pp. 205-211 Fisher's exact test; the χ^2 version of the two-sample median test.

p. 214 The W-W runs test. Also know how to use the material on pp. 84-85 to obtain p-values for the W-W runs test.

pp. 215-217 Empirical Q-Q plots.

pp. 220-226 Understand the justification of the confidence intervals given on p. 220 and p. 226, and know when you would use these confidence intervals.

p. 231 Empirical Q-Q plot.

pp. 237-241 Rationale for one-way ANOVA F test (but don't worry about the mgf stuff that I skipped in class).

p. 255 Connection between studentized range test and a set of Tukey simultaneous confidence intervals.

pp. 257-259 Bonferroni intervals, and their use in testing $H_0 : \mu_1 = \mu_2 = \cdots = \mu_k$ against the general alternative when the distributions are approximately normal but the variances aren't equal.

p. 277 Random effects model.

p. 282 Point estimators of σ_α^2. (Using (3.4) and (3.5) as starting points, you should be able to produce the estimator given by (3.6). Also, know why the estimator given by (3.7) is better than the one given by (3.6).)

p. 284 Confidence interval for σ_ε^2. (It isn't that the c.i. is very important, but rather I want you to make sure that you can use the method of pivotal quantities to obtain confidence intervals and this provides us

with another example.)

pp. 289-290 Rationale for two-way ANOVA F test for Factor A effect.

pp. 312-314 Hierarchical designs. (Know how to use the EMS column of the ANOVA table on p. 313 to arrive at the F statistics given on p. 314. Also, know how to produce point estimates for σ_ε^2, σ_b^2 and σ_b.)

p. 328 Pearson's chi-square goodness-of-fit test. (Know how to take the data in the example, compute the value of the test statistic, and make a statement about the p-value.)

p. 331 Proper df for chi-square test.

p. 333 Alternative expression for Q.

pp. 336-340 Test of independence of two or more factors.

In addition to the material indicated above, you are also responsible for any closely related material covered in class but not in the class notes.

Other Things to Know

- How to analyze a probit plot, and when the t test, sign test, signed-rank test, and Johnson's modified t test can/should be used.
- When the two-sampe t test, the two-sample median test (Fisher's exact test), the Wilcoxon rank sum test / Mann-Whitney test, the Wald-Wolfowitz runs test, and Welch's test can/should be used.
- The types of experimental designs the following nonparametric tests are used for: Wilcoxon signed-rank test, sign test, Wilcoxon rank sum test, Mann-Whitney test, Fisher's exact test, Kruskal-Wallis test, Steel-Dwass test, Friedman's test.

As for the finals from previous semesters that I've given you, don't spend much time looking over the problems that don't correspond to the material not being emphasized on your final exam. (In previous years I emphasized different things on the final, and advised the students accordingly, so that they could be prepared for the trickier problems.) While I might give you some problems similar to some of these problems, try to find time to study other things as well.

Answers to Fall 1997 exam:

1) `0.028`
2) `50.8, 4, p-value << 0.005`
3) `(6.54, 8.30), 1.47.  0.065`
4) `0.59`
5) `H`
6) `A, B, E, F, J`
7) `5.51, 2, 0.05 < p-value < 0.1`
8) `1.3, 2.2`
9) `0.033`
10) `approx. 13 thousand, approx. 6.5 thousand`