

## Stat {4601, 6872} Quiz #2 (50 minutes)

- Open book and open note.
- Use a simple calculator if necessary.
- Show your work. (E.g. Next to each numerical answer, you need to put things like  $P_{0.01}(B \geq 3)$  or something equivalent)
- All problems are 10 points unless otherwise noted.

1. (100 points) An experiment was conducted to measure and compare the effectiveness of various feed supplements on the growth rate of chickens. Newly hatched chicks were randomly allocated into three groups of size 5, 2, and 5, and each group was given a different feed supplement. Their weights in grams after six weeks are given along with feed types. The data is as follows:

	Weight	feed
1	179	horsebean
2	160	horsebean
3	136	horsebean
4	227	horsebean
5	217	horsebean
11	309	linseed
12	229	linseed
23	243	soybean
24	230	soybean
25	248	soybean
26	327	soybean
27	329	soybean
<del>28</del>	<del>250</del>	<del>soybean</del>

Answer the following.

- What's the relevant nonparametric test?
- Define the model formally/mathematically (using  $X_i, Y_i, \mu, \Delta$  etc) and state the necessary assumptions to apply the nonparametric test in a)
- Formally state the hypothesis (e.g.  $H_0: \mu=0$  vs.  $H_1: \mu > 0$  where  $\mu$  is the median ...)
- Compute the test statistic (20pt).
- Suppose, for the independent data with the same dimension, the test statistic is computed to be 5.0. Can you reject the null hypothesis at 5% significance level? Answer using the corresponding table in the textbook.
- Compute the P-value for the test statistic in (e).
- What's the equivalent parametric test? What's the extra assumption(s) you need to make about the distribution? (be specific)
- If the parametric and nonparametric tests give different answers, with a very small P-value (say 0.001) for the parametric test and a very large P-value (say 0.20) for the nonparametric test, what could be possible explanations of the reasons why? In such case, what would you do to clarify the issue? Finally, which test result would you choose? (20pt)

**Quiz #2 Answers**

- 1) Typical one-way layout
  - a) Kruskal-Wallis test
  - b)  $Y_{ij} = \mu + \tau_i + e_{ij}$ ,  $e_{ij} \sim \text{iid } F$ , continuous, everything is independent
  - c)  $H_0: \tau_1 = \dots = \tau_k$ , vs  $H_1$ : at least two  $\tau_i$  are different
  - d) 8.74
  - e) Using the table A. for 2, 5, 5 entry.  $P(H \geq 5.246) \sim 0.050$ . So we reject if  $H \geq 5.246$ . Can't reject  $H_0$  since the given  $H$  value of 5 is less than that.
  - f) The P-value is  $P(H \geq 5) \sim 0.060$ .
  - g) Analysis of variance. F-test. We need to assume the error distribution is Gaussian(normal).
  - h) Violation of the normal distribution assumption and/or outliers; look into the data by plotting them is the next thing to do. I will probably believe the nonparametric test result.