STA 4211 – Exam 1 – Spring 2014 – **PRINT** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**For all significance tests, use  = 0.05 significance level.**

Q.1. A study compared oxygen consumption of basketball players of r = 3 positions (guards, forwards, and centers). The following table gives the sample size, mean, and standard deviation for samples of players by position (the response was VO2max).

p.1.a. Complete the Analysis of Variance table, to test if population means differ by position. H0: G = F = C



p.1.b. Is the p-value for the test is **> 0.05** or **< 0.05** (circle the correct choice).

Q.2. For the following 2 scenarios (A and B), give E{MSTR}/E{MSE}:

p.2.a. n1 = n2 = n3 = 10 E{MSTR}/E{MSE} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

p.2.b. n1 = n2 = n3 = 5 E{MSTR}/E{MSE} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.3. In the broiler chicken study, with factor A (base diet: Sorghum, Corn) and factor B (methionine: absent, present), there were 60 chickens assigned to each treatment (nT=240). For the response weight of wing drumette, the mean square error was MSE = 60.0. The following table gives the treatment means:



p.3.a. Compute the following parameter estimates:



p.3.b. Compute the following Sums of Squares, degrees of freedom, mean squares, and F-statistics:

SSA = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dfA = \_\_\_\_\_\_ MSA = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ FA\*= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SSB = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dfB = \_\_\_\_\_\_ MSB = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ FB\*= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SSAB = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dfAB = \_\_\_\_\_\_ MSAB = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ FAB\*= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

p.3.c. For each F-test, conclude effects are significant if F\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q.4. An experiment was conducted to compare r = 4 methods of packaging steaks, in terms of the amount of bacteria measured after 9 days of storage. There were ni = 3 replicates per treatment. The treatment means and SSE were:



p.4.a. Compute the standard error of the difference between 2 means: 

p.4.b. Compute Tukey’s Honest Significant Difference for simultaneously comparing all pairs of packages, with a family-wise error rate of 0.05. Identify significant differences among all pairs of means.

 Trt4 Trt2 Trt3 Trt1

p.4.c. Compute Bonferroni’s Minimum Significant Difference for simultaneously comparing all pairs of packages, with a family-wise error rate of 0.05

p.4.d. Compute Scheffe’s Minimum Significant Difference for simultaneously comparing all pairs of packages, with a family-wise error rate of 0.05

Q.5. A city’s police force is interested in purchasing new uniforms. They select 4 styles, two from Brand A, and two from Brand B. They randomly assign officers to wear the 4 styles (8 officers per style), and record their comfort scores. They wish to compare the two brands by a contrast (assume styles 1 and 2 are for Brand A, and styles 3 and 4 are brand B). The results of their analysis include: 



Q.6. An experiment was conducted comparing 3 brands of battery. There were 3 batteries per brand were sampled, and their lifetimes (in weeks) were obtained. Obtain the rank sums for each brand, and obtain the treatment and error sums of squares of the ranks, and their degrees of freedom.



SSTRRanks = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ df = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SSERanks = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ df = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_