Stat/For/Hort 571 **Nordheim and Zhu** **December 17, 2000**

Final Exam

Name:____

For the lecture that you *attend* please indicate:
Instructor:(circle one) Nordheim Zhu

Instructions:

1. This exam is open book. You may use textbooks, notebooks, class notes, and a calculator.
2. Do all your work in the spaces provided. If you need additional space, use the back of the preceding page, indicating *clearly* that you have done so.
3. To get full credit, you must show your work. Partial credit will be awarded.
4. Some partial computations have been provided on some questions. You may find some *but not necessarily all* of these computations useful. You may assume that these computations are correct.
5. Do not dwell too long on any one question. Answer as many questions as you can.
6. Note that some questions have multiple parts. For some questions, these parts are independent; in such cases you can work, for example, on part (b) or (c) separately from part (a).

For graders' use:

Question	Possible Points	Score
1	22	
2	24	
3	16	
4	20	
5	18	
Total	100	

1. A study was undertaken to compare five different diet additives on the plasma phospholipid values in lambs. The following data were obtained from this study

diet additive	A	B	C	D	E
sample size	7	5	4	5	6
sample mean	22.97	22.72	30.10	25.52	34.22
sample standard deviation	4.51	4.76	5.59	4.44	5.14

Also, SSTRT = 567.38.

(a) Compute the ANOVA table. Carry out the test of the null hypothesis that the mean plasma phospholipid values are the same for all 5 diet additives. Interpret the results.

(b) Test the null hypothesis that the mean phospholipid value for diets B and D is equal to the mean phospholipid value for the diets A and E (versus the two-sided alternative). Report the p-value, and interpret the results.

2. A study was undertaken to relate the skeletal mass to the total body mass for a number of different mammal species. Based on theoretical arguments, the log (base 10) of the skeletal mass should be approximately linearly related to the log (base 10) of the total body mass. Presented below, are log (base 10) values for 11 species where the masses are the mean species values in kilograms.

x_i	log(10) body mass	0.53	1.35	0.62	0.82	1.07	0.59	0.68	0.65	0.46	1.30	0.92
y_i	log(10) skeletal mass	-0.72	0.06	-0.76	-0.34	-0.12	-0.63	-0.61	-0.56	-0.46	0.41	-0.04

$\sum x_i = 8.99$ $\sum y_i = -3.77$ $\sum x_i^2 = 8.2861$ $\sum y_i^2 = 2.6935$ $\sum x_i y_i = -2.0449$
$SSRegression = 1.1437.$

(a) Estimate the slope and intercept from a simple linear regression analysis of these data.

(b) The investigator on this study has hypothesized that the slope of the relationship relating skeletal mass to body mass (on the log scale) is 1.30. Test this hypothesis versus the two-sided alternative. Interpret your findings. (Note that SSRegr has been calculated for you.)

(c) The investigator wishes to consider a new mammal species for which the log(10) body mass is 1.20. Find a 95% confidence interval for the expected (population mean) skeletal mass (on the log scale).

3. You are interested in comparing the blooming time (the number of days that flowers bloom) for two varieties, A and B, of an ornamental flower. It is known that the blooming times for both varieties are distributed approximately as a normal with a variance of $(1.8)^2\ days^2$. You have only 8 seeds available for variety A; however, you have an unlimited supply of seeds for variety B. You plan on using n seeds from variety B. Find n so that a 95% confidence interval for the difference between the mean blooming times of the two varieties has a width of 2.70 days. (Assume that all seeds germinate and result in healthy plants.)

4. You have 3 coins, a red one, a blue one, and a green one. For each coin, you have the hypotheses, $H_0 : p = .5$ versus $H_A : p \neq .5$. The red coin is tossed (independently) 6 times and all result in heads. The blue coin is tossed (independently) 9 times and 8 result in heads. The green coin is tossed (independently) 40 times and 12 result in heads. Using the Bonferroni idea, provide a test for all three of these hypotheses using an experiment-wise error rate of 0.05.

5. Scientists are interested in studying the health of trees in tropical forests. For a given tree species, the scientists have developed a carefully defined scoring system for tree health using the numbers 1, 2, 3, and 4 where the higher the number, the more severe the disease. Based on climatic conditions, it is hypothesized that the mean disease score from this tree species is 1.5 with the alternative being two-sided. The scientists randomly selected 200 trees (of this species) and found that 70 tress had a score of 1, 80 had score 2, 50 had score 3, and 0 had score 4. Perform a test of the given hypothesis and interpret your results. [[Hint: Define the random variable of interest and make use of the Central Limit Theorem.]]