Review Problems - Midterm 1

1. An experiment was installed to test 4 rates of Zn on cabbage. There were 3 replicates and the experiment was installed in a randomized complete block design. The yields are given in the table below.

Treatment kg Zn/ha	Block		
	I	II	III
0	3.5	3.8	3.7
5	3.9	4.2	4.4
10	4.0	4.4	4.8
15	4.3	4.2	4.9

A. Calculate the analysis of variance for this data set and perform the appropriate F tests. Write the formula for each statistic calculated.

B. Subdivide the treatment SS into single df using 2 sets of orthogonal comparisons.

C. Calculate the SS for the orthogonal comparisons for trends using the orthogonal comparison method and perform the F tests.

D. Interpret the results.

2. Three varieties of cowpeas were grown in pots arranged in a completely randomized design. The dry matter yields are given in the table below.

Sample	Variety		
	A	B	C
1	2	8	11
2	4	7	10
3	3	9	12

a. Calculate the analysis of variance for the experiment conducted as a CR design.

b. Compare variety A with Others in the analysis of variance.

c. Compare variety B with variety C in the analysis of variance.

d. Perform the appropriate F tests and interpret the results.

e. Write out the analysis of variance (sources of variation and df) for this experiment installed in a randomized complete block design.

3. Write our the ANOVA (sources of variation and df) for the following experiment. Subdivide the treatment df where appropriate and indicate the F test(s) with arrows.

A. Three (3) varieties of wheat were compared in a completely randomized design with 4 plots of each variety.

4. Write out the orthogonal coefficients for the treatment combinations below. Indicate the df for the comparisons.

A. Four (4) varieties of sorghum (A, B, C, D) where variety A is the standard variety for the area.

B. Three (3) levels of P (0, 100, 200 kg/ha) in factorial combination with 2 levels of Zn (0, 10 kg/ha). Write out 2 sets of comparisons.

C. Six (6) herbicides are compared. Two are preemergence herbicides and 4 are postemergence herbicides.

D. Five (5) varieties of sweet corn with 2 varieties that are early maturing and 3 varieties that are late maturing.

5. Red clover plants were inoculated with 6 strains of Rhozobium and the nitrogen content of the plants was later determined. Each treatment was replicated 5 times and the experiment was conducted as a completely randomized design. The analysis of variance indicated that there was a highly significant difference between strains. The MSE was 11.79. The treatment means are given in the table below.

	Rhizobium strains					
	1	2	3	4	5	6
	N content (mg)					
Means	28.8	24.0	14.6	19.9	13.3	19.4

A. Compare the treatment means using the LSD (use lines and letters).

B. Compare the treatment means using Duncan's multiple range test (use letters).

6. Assuming and LSD of 3.4 compare the following means using lines and letters.

Treatments	K0	K1	K2	K3	K4
Means	12	17	21	22	24

7. Assuming Duncan's shortest significant difference values of

p =	2	3	4	5
D =	4.8	5.1	5.4	6.0

Compare the following sets of means.

A. 31, 30, 25, 24, 20
B. 37, 33, 31, 29, 25, 20

8. An experiment to test the effect of dietary chocolate on levels of the stress hormone cortisol in graduate students is designed with 6 treatments and 6 replicates. Give the sources and degrees of freedom and indicate all F-tests with arrows given the following conditions:

A. The experiment is installed as a completely randomized design.

B. The experiment is installed as a randomized complete block design (RCBD), with students blocked on previous academic performance.

C. The experiment is installed as a Latin square design with 6 students (columns) each receiving each treatment over 6 time periods (rows).

D. The experiment is installed as a RCBD and the treatments are 6 equally spaced levels of chocolate in the diet. Divide up the treatment degrees of freedom appropriately.

9. The effect of listening to recorded 603 lectures on cows' milk yield is to be investigated. Two treatments are to be used in the five hours just prior to milking: no sound played, or 603 lectures played. Ten cows are available for the experiment. The researcher is considering 4 possible experimental designs:

I Assign 5 cows randomly to receive each of the two treatments.
II For each cow, use each treatment and have the "no-sound" day come before the "lecture" day
III For each cow, use each treatment and randomize the order of the two measurements
IV For 5 randomly selected cows, have the "no-sound" treatment come first, and for the other 5 have the "lecture" come first.

a. One of these designs is a very poor choice because it can produce ambiguous results, results which will not allow us to decide what has caused any differences we find. Which one?

The poorest choice is ___, because

b. For two of the designs that are reasonable, identify the design, state the df that the relevant error term will have, and state one advantage and one disadvantage of each of these two designs.

Design (I,...,IV) _____ Type _____ df Error _____
Advantage:

Disadvantage:

Design _____ Type _____ df Error _____
Advantage:

Disadvantage: