STAT 514
Exam I — Spring 1995

Name _____

1) Dr. Chen and Dr. Tom are interested in studying the tumor inhibition properties of PALA (N-phosphonacetyl-L-aspartate). The layout for their experiment was as follows.

$0m\mu$ PALA	$10m\mu$ PALA	$20m\mu$ PALA	$30m\mu$ PALA
XXX	XXX	XXX	XXX

The response variable measured in each test tube was Y = growth rate of tumor cells. In my ANOVA, level of PALA is significant with $p = .03$.

a) What is the approximate comparisonwise error rate if I do SNK at $\alpha = .05$?

b) What set of contrasts correspond to the comparisons made in a)? If I tested these contrasts at $\alpha = .05$, what is the approximate experiment-wise error rate?

c) How could I tell that the contrasts in b) cannot be orthogonal *without* checking the definition of orthogonality?

d) Suppose I compare the control group to the others using a one-sided Dunnett's test ($\alpha = .05$). Are there a set of contrasts which correspond to this at some α level? Why?

e) Suppose that the experimenters believe (prior to the experiment) that PALA has no effect until $15m\mu$, and then that the effect is constant above that dose. What set of orthogonal contrasts test these hypotheses?

f) What is the *main* danger in picking contrasts after seeing the data?

2) In a finishing plant, I randomly select 3 operators and 3 machines to see the effect of rotation speed on gloss of the finished part. There are 2 speeds I will use in the experiment, 80 and 100 r.p.m.

a) Draw the layout (everything is crossed), 3 observations per cell.

b) The ANOVA table for the above is:

Source	df	SS	EMS
O_i		323	
M_j		421	
S_k		373	
OM_{ij}		127	
OS_{ik}		111	
MS_{jk}		101	
OMS_{ijk}		89	
$\varepsilon_{(ijk)\ell}$		352	

Fill in d.f. and EMS (using the algorithm).

c) Conduct the appropriate F-tests, pooling when possible.

d) Outline your post-F-test analysis.

3. Consider Figure 2-9 on page 32 of Montgomery. Suppose $\sigma = 5$.

a) Suppose I wish to detect a mean difference of 5 with power = 80%. What should the sample size be?

b) If the sample size was 4, and the mean difference was 10, what would my power be?

c) For what standard deviation could I detect a mean difference of 20 with probability 60%?