Statistics 506
Final Exam

1. A researcher wants to study 4 factors in 8 runs using two blocks. The researcher eventually selects the following design:

Block 1	Block 2
1, -1, -1, 1	-1, -1, -1, -1
1, 1, -1, -1	-1, 1, -1, 1
-1, -1, 1, 1	1, -1, 1, -1
-1, 1, 1, -1	1, 1, 1, 1

(a) Using the Define Custom Factorial Design feature, identify the design generator and the effects confounded with Block.

(b) If the ordered observations for Block 1 are 94, 99, 99, 95 and the ordered observations for Block 2 are 99, 96, 97, 100, analyze the design.

(c) By default, Minitab would use the design generator I=ABCD and confound Block with AB+CD. In light of the analysis above, would this have been a good design choice?

2. Three factors were analyzed in a replicated full factorial design. The mean and sample variance appear below. The goal of the experiment is to achieve a process target as small as possible with as little variation as possible.

Factor settings	$\bar{y}$	$\log s$	SN_s
(-1,-1,-1)	10.04	-1.25	-46.14
(1,-1,-1)	8.03	1.20	-42.75
(-1,1,-1)	4.47	1.32	-33.77
(1,1,-1)	5.12	1.33	-35.79
(-1,-1,1)	15.01	0.61	-54.27
(1,-1,1)	13.94	-0.48	-52.71
(-1,1,1)	13.02	2.02	-53.34
(1,1,1)	13.18	0.25	-51.63

(a) Analyze the mean $\bar{y}$. Using only the significant effects, how would you adjust the process so that the response is minimized? What is the EMR at your recommended setting?

(b) Analyze the natural log of the variance, $\log s$. Using only the significant effects, how would you adjust the process so that the variance is minimized? (Do not compute EMR.)

(c) Analyze the "smallest is best" signal-to-noise ratio SN_s. Using only the significant effects, how would you adjust the process so that the response is maximized? (Do not compute EMR.) Compare your conclusions among the different approaches.