

Name: _____

Class: _____

Class #: _____

Section #: _____

Instructor: Nathaniel Stevens

Assignment: Quiz 10

Question 1: (1 point)

The efficacy of the 2^{K-p} fractional factorial design for screening purposes is *primarily* due to:

- (a) The Pareto principle
- ☒ (b) The principle of effect sparsity
- (c) The principle of effect heredity

Question 2: (4 points)

Consider a 2^{7-p} fractional factorial design. What values of p are permissible? Selection all that apply.

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☐☒ 1☐☒ 2☐☒ 3☐☒ 4☐

5

☐

6

☐

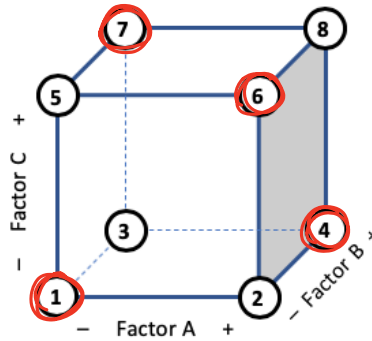
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☐

$$p \in \mathbb{Z}^+, \quad 1 \leq p < 7, \quad 2^{7-p} > 7$$

Question 3: (4 points)

Consider the full 2^3 factorial design illustrated by the cube below.



Also consider the 2^{3-1} fractional factorial design with design generator $C = -AB$. Which of the eight conditions in the full 2^3 factorial design are run in this 2^{3-1} fractional factorial design? Select all that apply.

- ☒ 1
☐ 2
☐ 3
☒ 4
☐ 5
☒ 6
☒ 7
☐ 8

A	B	C = -AB	
-1	-1	-1	①
1	-1	1	⑥
-1	1	1	⑦
1	1	-1	④

Question 4: (1 point)

The design matrix for a 2^{4-1} fractional factorial design is shown below.

A	B	C	D = BC
-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

What is the design generator for this design?

- (a) $D = AB$
- (b) $D = AC$
- (c) $D = BC$
- (d) $D = ABC$

Question 5: (6 points)

Consider the fractional factorial experiment with $K = 5$ factors and the following complete aliasing structure:

8 rows { I = ABD = ACE = BCDE ← min word length is 3
 A = BD = CE = ABCDE
 B = AD = ABCE = CDE
 C = ABCD = AE = BDE
 D = AB = ACDE = BCE
 E = ABDE = AC = BCD
 BC = ACD = ABE = DE
 BE = ADE = ABC = CD

- (a) How many experimental conditions are there? 8
- (b) In the notation 2^{K-p} , what is the value of p here? 2
- (c) What is this design's resolution? Use Arabic (as opposed to Roman) numerals. 3
- (d) What are the design generators? Select all that apply
- (a) D=BC
 - (b) E=ABC
 - (c) D=ABC
 - (d) E=AB
 - (e) E=BC
 - (f) D=AC
 - ☒ (g) E=AC
 - ☒ (h) D=AB
- (e) True or False: The main effect of factor C can be estimated separately from the AE interaction effect.
- (a) True
 - ☒ (b) False

Question 6: (2 points)

Consider the 2^{8-3} fractional factorial designs arising from the following two choices of design generators.

Design #1: $F = ABC$, $G = ABD$, $H = ACDE$

Design #2: $F = ABC$, $G = ABD$, $H = ACD$

With respect to the *maximum resolution* criterion, which of the following statements is true?

- (a) Design #1 is better than Design #2
- (b) Design #2 is better than Design #1
- ☒ (c) Designs #1 and #2 are equivalent

With respect to *minimum aberration* criterion, which of the following statements is true?

- ☒ (a) Design #1 is better than Design #2
- (b) Design #2 is better than Design #1
- (c) Designs #1 and #2 are equivalent

Design #1 defining relation:

$$I = ABCF = ABDG = ACDEH = CDFG = BDEFH = BCEGH = AEFGH$$

↳ Word length septuple: $(4, 4, 5, 4, 5, 5, 5)$

↳ Resolution = IV

Design #2 defining relation:

$$I = ABCF = ABDG = ACDH = CDFG = BDFH = BCGH = AFGH$$

↳ Word length septuple: $(4, 4, 4, 4, 4, 4, 4)$

↳ Resolution IV