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Courses » Design and Analysis of Experiments

Announcements

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Mentor

Unit 8 - Week 7

Course outline

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Lecture 36: Two-level Factorial Experiment

Lecture 37: Statistical Analysis of 2^k Factorial Design

Lecture 38: 2^k Factorial Design: Single Replicate

Lecture 39: 2^k Factorial Design with Center Point

Lecture 40: 2^k Factorial Design: Optimality Issues

Feedback for week 7

Quiz : Week_7_Assignment_7

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Week_7_Assignment_7

The due date for submitting this assignment has passed.

Due on 2018-03-14, 23:59 IST.

Submitted assignment

1) The expression to calculate the interaction effect of two factors (say, A and B) i.e., AB is:

2 points

(i) $AB = \frac{1}{2n} [ab + (1) - a - b]$

(ii) $AB = \frac{1}{2n} [a + b + (1) - ab]$

(iii) $AB = \frac{1}{2n} [ab + (1) + a - b]$

(iv) $AB = \frac{1}{2n} [ab + (1) + b - a]$

No, the answer is incorrect.

Score: 0

Accepted Answers:

(i) $AB = \frac{1}{2n} [ab + (1) - a - b]$

2) The expression to calculate the interaction effect of three factors (say, A, B, and C) i.e., ABC is:

2 points

(i) $ABC = \frac{1}{4n} [abc + bc - ac + c - ab + b + a - (1)]$

(ii) $ABC = \frac{1}{4n} [abc + bc - ac + c - ab + b - a - (1)]$

(iii) $ABC = \frac{1}{4n} [abc - bc - ac + c - ab + b - a - (1)]$

(iv) None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

(iv) None of these

3) In 2³ design with n replicates, contrast of any effect can be computed by (where SS denotes sum of squares of any effect):

2 points

(i) Contrast = $\frac{n}{SS}$

(ii) Contrast = $\frac{8n}{SS}$

(iii) Contrast = $\sqrt{n \times SS}$

(iv) Contrast = $\sqrt{8n \times SS}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

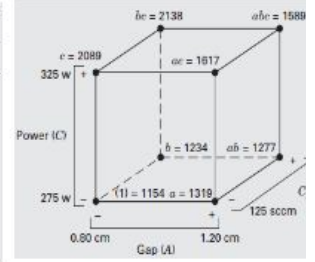
(iv) Contrast = $\sqrt{8n \times SS}$

Questions 4- 10 are based on the following case:

A 2³ factorial design was used to develop a nitride etch process on a single-wafer plasma etching tool. The design factors are the gap between the electrodes, the gas flow (C2F6 is used as the reactant gas), and the RF power applied to the cathode. Each factor is run at two levels, and the design is replicated twice. The response variable is the etch rate for

silicon nitride ($\text{\AA}/\text{m}$). The etch rate data and the design are shown below.

Run	Coded Factors			Etch Rate			Factor Levels		
	A	B	C	Replicate 1	Replicate 2	Total	Low (-1)	High (+1)	
1	-1	-1	-1	550	604	(1) = 1154	A (Gap, cm)	0.80	1.20
2	1	-1	-1	669	650	a = 1319	B (C_2F_6 flow, SCCM)	125	200
3	-1	1	-1	633	601	b = 1234	C (Power, W)	275	325
4	1	1	-1	642	635	ab = 1277			
5	-1	-1	1	1037	1052	c = 2089			
6	1	-1	1	749	868	ac = 1617			
7	-1	1	1	1075	1063	bc = 2138			
8	1	1	1	729	860	abc = 1589			



4) The effect of factor A is estimated as equal to:

2 points

- (i) 101.625
 (ii) -101.625
 (iii) 100.265
 (iv) -100.265

No, the answer is incorrect.

Score: 0

Accepted Answers:

(ii) -101.625

5) The effect of factor AC is estimated as equal to:

2 points

- (i) -153.625
 (ii) -155.625
 (iii) -255.625
 (iv) -254.625

No, the answer is incorrect.

Score: 0

Accepted Answers:

(i) -153.625

6) The effect of factor ABC is estimated as equal to:

2 points

- (i) 3.256
 (ii) 4.562
 (iii) 5.265
 (iv) 5.625

No, the answer is incorrect.

Score: 0

Accepted Answers:

(iv) 5.625

7) The factor which has the highest contribution is:

2 points

- (i) A
 (ii) B
 (iii) C
 (iv) ABC

No, the answer is incorrect.

Score: 0

Accepted Answers:

(iii) C

8) The factor having the least contribution is:

2 points

- (i) A
 (ii) B
 (iii) C
 (iv) None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

(iv) None of these

9) The degrees of freedom for error is:

2 points

- (i) 5
 (ii) 6
 (iii) 7

(iv) None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

(iv) None of these

10) The regression model for predicting etch rate is:

2 points

(i) $\hat{y} = 776.0625 - 50.81x_1 + 153.06x_3 - 76.81x_1x_3$

(ii) $\hat{y} = 776.0625 + 50.81x_1 - 153.06x_3 + 76.81x_1x_3$

(iii) $\hat{y} = 776.0625 - 50.81x_1 - 153.06x_3 - 76.81x_1x_3$

(iv) None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

(i) $\hat{y} = 776.0625 - 50.81x_1 + 153.06x_3 - 76.81x_1x_3$

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