

Quality Engineering and Design of Experiments, Spring 2017

Homework #3

Due: 2017/04/20, 09:10

1. (50 pts)

- (a) Which orthogonal array will you choose to design an experiment involving two-level factors A, B, C, and D and interactions $A \times B$, $C \times A$, and $B \times C$? How do you assign the factors and interactions in the array you choose?
- (b) Which orthogonal array will you choose to design an experiment involving two two-level factors A, B, C, and D and interactions $A \times B$ and $C \times D$? How do you assign the factors and interactions in the array you choose?
- (c) For the experimental results, obtained using an L-8 array, shown in Table 1, assume that only the interaction $A \times B$ exists.
 - (1) Establish the response table, and determine the main effects of the six factors and the interaction effect ($E_{A \times B}$).
 - (2) Make the response graph for the six factors.
 - (3) Make the interaction graph for A and B.
 - (4) Take the interaction into consideration, what is the optimal combination of the six factors (i.e. to have the largest y)?
 - (5) What is the predicted y under the factor combination obtained in (4)?

Table 1 Experimental results

Exp.	A (1)	B (2)	C (4)	D (5)	E (6)	F (7)	y
1	1	1	1	1	1	1	24
2	1	1	2	2	2	2	30
3	1	2	1	1	2	2	16
4	1	2	2	2	1	1	22
5	2	1	1	2	1	2	32
6	2	1	2	1	2	1	22
7	2	2	1	2	2	1	26
8	2	2	2	1	1	2	18

2. (5 pts) What is a saturated orthogonal array?