CHAPTER 12

Reserved Problems

12.1R Consider the experiment in Problem 11.1R. Suppose that temperature is a noise variable ($\sigma_z^2 = 1$ in coded units). Fit response models for both responses. Is there a robust design problem with respect to both responses? Find a set of conditions that maximize conversion with activity between 55 and 60 and that minimize the variability transmitted from temperature.

12.2R Consider the connector pull-off force experiment shown in Table 12.2. What main effects and interaction involving the controllable variables can be estimated with this design? Remember that all of the controllable variables are quantitative factors.

12.3R Reconsider the situation in Problem 12.11. Could a modified small composite design be used for this problem? Are any disadvantages associated with the use of the small composite design?

12.4R Suppose that you have a robust design problem with 4 continuous process variables and 3 continuous noise variables. You should assume that the controllable variables will require that a second-order model be used, however the noise variables have primarily linear main effects but can interact with the linear main effects of the process variables.

(a) Write down an appropriate response model.

(b) What is the minimum number of runs required to fit this model?

(c) Find an *I*-optimal design using the minimum number of runs.

(d) Find a *D*-optimal design using the minimum number of runs.

(e) Compare the two designs that you constricted in parts c and d.

12.5R Reconsider the situation in problem 9.7R. Suppose that you decide to use more than the minimum number of runs in your experiment. Construct *I* and *D*-optimal designs using 5 additional runs above the minimum number. Compare these designs with the minimum run designs from problem 12.4R. What have you gained by using more than the minimum number of runs?

12.6R Reconsider the situation in problem 12.4R. Suppose that you think that the noise variables could interact with the main effects of the controllable process variables and also the two-factor interactions involving the process variables. What design would you ecommend for this situation?

12.7R Suppose that the fitted response model is $\hat{y} = 10 + 3x_1 + 5x_2 + 4z + x_1z - 2x_2z$. What is the model for the mean? What is the model for the transmitted variance? What value of z minimizes the transmitted variance?