**Six Sigma Statistics Using Minitab 19**

**Module 13 Quiz, DOE**

1. What is the difference between Regression and DOE? *The difference is that with DOE we plan the series of experiments that we are going to conduct and we pre-plan the levels of the factors we are going to use. Whereas in Regression, it’s usually the case of grabbing pre-existing data and throwing it all into the Regression Calculation.*
2. What are the similarities between Regression and DOE? *The both analyse a bunch of predictors and a response variable to form a model. Interaction and higher order terms can be included in the model.*
3. True or False, a DOE is usually more efficient in terms of runs than a regression study? *True.*
4. True or False, a ‘2 level factorial DOE’ is so called as it only takes two factors? *False.*
5. How is the Effect of a Factor calculated? *It is the Average of responses at high levels - average of responses at low levels.*
6. What are the two starting points of the Analyse DOE routine in the Assistant? *Create Screening Design or Create Modelling Design.*
7. Once you have analysed the modelling design the Assistant may off you the option of? *Adding additional points to fit a quadratic model.*
8. When should you start with a screening design? *When you have between 6 & 15 suitable factors.*
9. When should you start with a modelling design? *When you have between 2 & 5 suitable factors.*
10. Why do we use Blocks in DOE? *If there are a large number of runs that cannot be completed without interruption then blocks can be assigned to each batch of runs. Minitab then analyses if there is a difference between blocks.*

**Multiple Choice Questions**

1. Look at the types of DOE shown below. What is the order of DOE’s used in the Sequential DOE methodology that the Assistant uses?

i) Quadratic Model ii) Mixture DOE iii) Modelling DOE iv) Screening DOE
a) iv, iii, i **Correct Answer**

b) iii, ii, i

c) iv, iii, ii

d) iv, i, ii

1. What is the key purpose of the Sequential DOE methodology ?
a) To build a model. b) To link predictors to a response.

c) To avoid multicollinearity issues.

d) To reduce the number of experimental runs. **Correct Answer**

1. What type of data is used for the levels of a factors in a DOE within the Assistant?
a) Categorical

b) Counts of defects.
c) Numeric- Continuous. d) Categorical & continuous **Correct Answer**

1. What type of data is required for the response to run a DOE within the Assistant?
a) Categorical

b) Numeric- Discrete.
c) Numeric- Continuous. **Correct Answer**d) Categorical & continuous.

1. What confidence level does the Assistant use in Sequential DOEs to select significant Factors?
a) 0.05

b) 0.1
c) 0.9 **Correct Answer**d) 0.95

1. What is the purpose of increasing the runs and folding the design?
a) To avoid multicollinearity issues.

b) To reduce the number of experimental runs.

c) To check for interaction terms.

d) To detect smaller effects. **Correct Answer**

1. What are the titles of the four ‘Admin Columns’ that the Assistant will add to an experimental worksheet?
a) Blocks, PtType, StdOrder, RunOrder. **Correct Answer**

b) Blocks, PtOrder, Stdtype, RunOrder.

c) Blocks, PtType, StdOrder, RunType.

d) Blocks, PtType, StdOrder, Lipids.

1. Which one of these is not a pre-requisite to conducting a Screening or Modelling DOE?
a) Eliminating special cause variation.

b) Conducting a Process Capability Study. **Correct Answer**

c) Verifying the response and factor measurement systems.

d) Ensuring factors are independent and experimental factor levels can be achieved.

1. In Example 13.5.1 with reference to the screening design, in terms of StDev what size of effect would the DOE have been able to detect if the experiment was not folded?
a) 0.81 StDevs.

b) 1 StDevs.

c) 1.07 StDevs.

d) 2.3 StDevs. **Correct Answer**

1. In Example 13.5.1 what were found to be the significant factors in the modelling DOE?
a) Sugars, Temperature & pH. **Correct Answer**

b) Lipids, Temperature & pH.

c) Sugars, Light & pH.

d) Lipids, Light & pH.

1. In Example 13.5.1 within a 95% confidence what is the highest individual GrowthRate that is likely to be achieved?
a) 95.977

b) 109.979

c) 114.354

d) 132.73 **Correct Answer**

1. In Example 13.5.1 within a 95% confidence what is the highest mean GrowthRate that is likely to be achieved?
a) 95.977

b) 109.979

c) 114.354 **Correct Answer**

d) 132.73

1. In Example 13.6.1 which factor produced the quadratic term?
a) MMT

b) Type of Tyre

c) TEL

d) Ferrocence **Correct Answer**

1. In Example 13.6.1 why did we need to use the Assistants multiple regression routine in addition to the DOE?
a) To check we had the right factors.

b) To identify the quadratic term.

c) To validate the study.

d) To obtain the model equations **Correct Answer**

1. In Example 13.6.1 when we used the Assistants multiple regression routine how did we know we had the same solution as the DOE?
a) From the regression equation.

b) As the significant factors were the same.

c) We obtained the same R-sq value and 95%PI. **Correct Answer**

d) We were not sure they were the same.