# Module 5 QUESTIONS ON DESIGN OF EXPERIMENTS

1. What is the name of a Design of experiments in which all levels of a given factor are combined with all levels of every other factor in the experiment (all possible combinations of the levels of the factors are investigated.)?
2. A design of experiments that requires the smallest number of runs for studying the effects of k factors.
3. The difference in response between the levels of one factor is not the same at all levels of the other factors. (e.g. the effect of factor A depends on the level of factor B). What is the name of this phenomenon?
4. A Design of experiment model used in screening experiments in which many factors are considered with the purpose of identifying those factors that have large effects and in which is assumed that certain high order interactions are negligible.
5. A Factorial Design of Experiments is performed with two factors A and B each run at two levels "High" and "Low". The experiment is replicated three times (n=3). The data are shown below.

| Treatment Combination | Replicates | | | |
|---|---|---|---|---|
| | I | II | III | Total |
| A Low and B High | 29 | 26 | 27 | 82 |
| A High and B Low | 34 | 31 | 33 | 98 |
| A Low and B High | 18 | 19 | 22 | 59 |
| A High and B High | 32 | 29 | 30 | 91 |

Standard Order Notation

| Run | A | B | AB | Treatment Combinations | Responses (Total) |
|---|---|---|---|---|---|
| 1 | - | - | + | (1) | 82 |
| 2 | + | - | - | a | 98 |
| 3 | - | + | - | b | 59 |
| 4 | + | + | + | ab | 91 |

6.An YX Diagram helps point the black belt into a direction with factual evidence.

a) True
b) False

7.If the cp is 1.0, what is the sigma value?

a) 1
b) 2
c) 3
d) 6
e) None of the above

8.The 95 percent confidence interval increase as the standard deviation decreases.

a) True
b) False

9.Sample size has no effect on the width of a distribution.

a) True
b) False

10.Howmany runs does a $(2)^3$ full factorial experiment consists of?

a) 6
b) 5
c) 8
d) 12

11.One-Factor at –a-time experiments generate more powerful data than a full factorial experiment.

a) True
b) False

12. What is an experimental factor?

a) The input variables for the experiment
b) The metrics of the process
c) A Covariant
d) The largest standard deviation

13. What does orthogonal mean?

a) One or more effects that cannot unambiguously be attributed to a single factor or factor interaction
b) Involves running the experimental runs in random order
c) A property that ensures that all experimental factors are independent of each other; no correlation exists between X's.

14. What tools can be used to determine if factors have interaction?

a) Balanced ANOVA
b) Standardized effects
c) Interaction Plots
d) Fractional factorial fits
e) All of the above

15.Why do we replicate our experimental runs?

a) So we can look for special causes
b) To obtain a better estimate of the error and look at interaction
c) To determine the factor levels.
d) So we can look at the same thing run again

16.Fractional factorial designs require more runs than full factorial designs given the same number of factors.

a) True
b) False

17.What is the main reason for using a fractional factorial design?

a) Allows you to test and screen a large number of factors in fewer runs
b) Gives you good estimates of low order interactions
c) Gives you relative significance of the factors
d) All of the above.

18. Given three factors A, B, C the highest –order interaction would be ABC.

a) True
b) False

19. What does it mean when A is confounded with BC?

a) A is contributed to the result
b) BC is contributed to the result
c) The computed coefficients are related to the sum of the two individual effects.
d) The sums of squares are related to the sum of the two individual effects

20. What are control charts?

a) Design Of Experiments (DOE)
b) A Plot showing the Y over time
c) Charts showing average control
d) Charts used to routinely monitor quality.

21.What does a P-Chart track?

a) Process chart showing the main factors
b) Sample size of the process overtime
c) Simple chart used to track the number of nonconforming units, percentage of defective parts, assuming that sample size is not necessarily constant.
d) None of the above

22. The purpose of performing a designed experiment is to determine what?

a) The mathematical relationship Y=F (x1, x2, x3,)
b) Which X's most impact Y and therefore need to be controlled
c) The level of each X to achieve the desired mean Y
d) The level of each X to minimize the variability of Y
e) All of the above

23.If an experimenter is interested in looking at variables that effect the response, those variables are called

a) Treatments
b) Factors
c) Effects
d) Levels