

MA8452-STATISTICS & NUMERICAL METHODS
Two mark questions & answers
UNIT – II DESIGN OF EXPERIMENTS

1. Write any two difference between RBD & CRD Apr-May2011

CRD	RBD
a. It is one way classification analysis of variance	It is two way classification analysis of variance
b. Experimental error is large	It is more different then CRD because of reduced experimental error

2. Discuss the advantages and disadvantages of RBD Apr-May2010

Advantages :

- a. It has a simple layout but it is more efficient than CRD because of reduction of experimental error
- b. It is flexible and so any number of treatments and any number of replication may be used.
- c. It is a two way classification analysis of variance.

Disadvantages :

- a. If the number of treatments is large than the size of the blocks will increase this may cause heterogeneity within blocks
- b. The shape of the experimental material should be rectangular.

3. State the advantages of a factorial experiments over a simple experiment. Apr-May2010

- a. Factorial design are widely used in experiments involving several factors where it is necessary to study the effort of the factory on a response.
- b. The factorial design are more efficient than one factor at a time experiments.
- c. Factorial designs form the basis of other designs of considerable Practical value.

4. Why a 2 x 2 Latin square is not possible? Explain Apr-May2007/2008

Consider $n \times n$ Latin square design, the degrees of freedom for SSE is

$$\begin{aligned}
 &= (n^2 - 1) - (n - 1) - (n - 1) - (n - 1) \\
 &= n^2 - 1 - 3n + 3 \\
 &= n^2 - 3n + 2 \\
 &= (n - 1)(n - 2)
 \end{aligned}$$

for $n = 2$, degrees of freedom $S.S.E = 0$ and hence MSE is not defined. Hence a 2×2 Latin square design is not possible.

5. Compare and contrast LSD and RBD**Apr-May 2006, 2009****LSD**

- a. It is suitable for small number of treatments, between 5 and 12
- b. The number of rows and columns are equal and hence the number of replications is equal to the number of treatments
- d. Experimental error is reduced to a large extent, because variation is controlled in two directions
- d. Experimental area must be a square

RBD

- No such restrictions suitable for upto 24 treatments.
- There is no such restrictions. It can have any number of replications and treatments.
- Variations is controlled in one direction only.
- It is a rectangle (or) square.

6. What are the basic principles of the design of experiments? Nov-Dec 2011/Nov-Dec 2012**May-June 2011**

- i. Replication
- ii. Randomization
- iii. Local control

7. Define "Analysis of variance" or ANOVA

According to R.A. Fisher, analysis of variance is the separation of variance ascribable to one group of causes from the variance ascribable to other groups.

8. Write down the assumptions in analysis of variance Nov-Dec 2010/Nov-Dec 2011

- i. Normality,
- ii. Homogeneity
- iii. Independence of error

9. Define RBD**Nov-Dec 2012**

Let us consider an agricultural experiment using which we wish to test the effect of 'k' fertilizing treatments on the yield of crops. We assume that we know some information about the soil fertility of the plots. Then we divide the plots into 'h' blocks, according to the soil fertility each block containing 'k' plots. Thus the plots in each block will be of homogeneous fertility as far as possible within each block, the 'k' treatments are given to the 'k' plots in a perfectly random manner, such that each treatment occurs only once in any block. But the same k treatments are repeated from block to block. This design is called Randomised Block Design.

10. What are the advantages of the Latin square design over other designs. May-June 2011

The advantages of the Latin square design over other designs are :

- (i) With a two-way stratification or grouping, the Latin Square controls more of the variation than the completely randomized design or the randomized completely block design. The two-way elimination of variation often results in small error mean square.
- (ii) The analysis is simple, it is only slightly more complicated than that

for the randomized complete block design.

(iii) The analysis remain relatively simple even with missing data, Analytical procedures are available for omitting one or more treatments, rows, or columns.

However the number of treatments is limited to the number of rows and columns except in some situations. For more than ten treatments, the Latin square is seldom used.

11. What do you understand by “Design of an experiment”?

The design of experiment may be defined as “the logical construction of the experiment in which the degree of uncertainty with which the inference is drawn may be well defined.

12. What are the advantages of a completely randomized experimental designs?

Nov-Dec2010

The following are the main advantages of this type of design :

1. It is easy to lay out the design.
2. It allows for complete flexibility. Any number of factor classes and replications may be used.
3. The statistical analysis is relatively simple, even if we donot have the same number of replicates for each factor class or if the experimental errors are not the same from class to class of this factor.
4. The method of analysis remains simple when data are missing or rejected and the loss of information due to missing data is smaller than with any other design.

13. What is the aim of the design of experiments?

The main aim of the design of experiments is to control the extraneous variables and hence to minimize the experimental error so that the results of the experiments could be attributed only to the experimental variables.

14. Define experimental error.

The estimation of the amount of variation due to each of the independent factors separately and then comparing these estimates due to assignable factors with the estimate due to the chance factor is known as experimental error or simple error.

15. When do you apply analysis of variance technique?

To test the homogeneity of several means.
