M 23120

Reg. No. : .....

Name : .....

II Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.) Examination, March 2013

STATISTICS

Paper – 2.3 : Design and Analysis of Experiments

Time : 3 Hours Max. Marks : 70

Instructions : *Answer **any five** questions without omitting **any** Unit.*
***All** questions carry **equal** marks.*

UNIT – I

1. a) Describe a Gauss-Markoft setup and give an illustration.
   b) Define estimability of a linear parametric function.
   c) State and prove a necessary and sufficient condition for the estimability of a linear parametric function, $\lambda'\theta$. **(4+2+8)**

2. a) Define the terms – estimation space and error space.
   b) Develop the procedure to test linear hypothesis based on a linear model, stating clearly the assumptions that are made. **(6+8)**

UNIT – II

3. a) Discuss the principles of experimentation pointing out their role in the design and analysis if experiments.
   b) For a single factor ANOVA with a fixed linear model, establish the fundamental identity (in the usual notation) $SS_T = SS_{Treatment} + SS_E$. **(7+7)**

4. a) Define (i) Latin square and (ii) Orthogonal Latin square – Develop the ANOVA for Latin square design.
   b) In a RBD with 'k' treatments and 'r'. (r > k) replications, one observation is missing in the i^{th} block. Derive expression for estimate of the missing observation and hence give a computational procedure for the analysis of the data. **(7+7)**

P.T.O.

UNIT – III

5. a) Explain :
   i) Factorial experiments ii) Main effects and
   iii) Interactions.
   b) What are the advantages and disadvantages of the factorial experiments ?
   c) Explain the analysis of a 2^3 – factorial experiment using Yates method and carry out its ANOVA. **(4+2+8)**

6. a) What is meant by confounding ? Explain the need for confounding is factorial experiments.
   b) Construct a 2^5 – factorial design in blocks of 8 plots confounding ABC, ADE and BCDE. Give the analysis of such a design with r replications. **(4+10)**

UNIT – IV

7. a) Establish the following parametric relations (in the usual notation) of BIBD.
   i) $v\,r = bk$ ii) $\lambda(v-1) = r(k-1)$
   b) Carry out the intra-block analysis of a PBIBD, obtaining expressions for sum of squares and mean squares. **(6+8)**

8. a) Explain the situation in which you would recommend the use of split-plot design. Write down the ANOVA table for a split-plot design with 'm' main plot treatments and 'n' sub plot treatment with RBD layout for main plot treatments.
   b) Show that the design obtained by taking blocks for treatments and treatment for blocks in the RBD with parameters $b = \frac{r(v-k)}{2}$, $k = 2$, $r = v-1$, $\lambda = 1$, is a PBIBD. **(10+4)**

UNIT – V

9. a) With reference to a general block design, define
   i) Connectedness and ii) Orthogonality.
   b) Establish a necessary and sufficient condition for a block design to be connected.
   c) Discuss the relevance of mixed plot analysis. **(4+6+4)**

10. a) Explain the analysis of covariance with reference to a RBD model with one concomitant variable.
   b) Discuss the optimality criterion for experimental design. **(7+7)**