



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

FOURTH SEMESTER – APRIL 2017

ST 4813- APPLIED EXPERIMENTAL DESIGN

Date: 18-04-2017
09:00-12:00

Dept. No.

Max. : 100 Marks

SECTION - A

Answer ALL questions. Each carries TWO marks.

(10 x 2 = 20 marks)

1. What are the assumptions made in order to make the F-test valid in ANOVA?
2. Mention the three basic principles of experimental designs.
3. Give the meaning and reason for experimental error.
4. Write the advantages of CRD.
5. Show that LSD is more efficient than RBD.
6. How many 4 x 4 standard LSD are possible? List all of them.
7. List the reasons for missing the value(s) of the response variable for some experimental units.
8. Discuss the applications of factorial experiment in industry.
9. Describe any two situations where Split Plot Design can be used.
10. When do we say a BIBD is resolvable? Explain with an illustration.

SECTION – B

Answer any FIVE questions. Each carries EIGHT marks.

(5 x 8 = 40 marks)

11. For analyzing the one-way classified data, state the fixed effect model, assumptions, and hypotheses and find the least square estimates of the parameters.
12. How will one estimate two missing observations in RBD?
13. Develop Yates' computational rule for calculating factorial effect totals in 2^2 and 2^3 factorial experiments.
14. Show that the interactions AB, AC and BC and ABC are mutually orthogonal contrasts of the treatment means, in a 2^3 factorial experiment. Also verify if $AB = BA$ and $ABC = CBA$.
15. Describe the calculation of sum of squares due to confounded effects. Write the advantages and disadvantages of confounding.
16. For a BIBD with $v=4$, $b=6$, $k=2$, $r=3$, $\lambda=1$, write its incidence matrix N. Verify if (i) every row sum of N is 'r', (ii) every column sum of N is 'k', and (iii) the inner product of any two rows of N is λ .
17. Write an explanatory note on experiments with factors at three levels each.
18. How does Youden square design help in eliminating the effect of positions? What are the possibilities of obtaining Youden squares?

SECTION – C

Answer any TWO questions. Each carries TWENTY marks.

(2 x 20 = 40 marks)

- 19(a) Explain the objective of 'Analysis of Covariance'. (4)
(b) Describe in detail about the implementation of ANOCOVA technique for the analysis of one-way classified data with a single concomitant variable in CRD layout. (16)
- 20(a) Explain the technique of analyzing a BIBD without recovery of interblock information. (10)
(b) Discuss in detail about the Analysis of Variance of 2×3 asymmetrical factorial design. (10)
- 21(a) Explain the procedure of calculating one missing value in LSD and discuss its statistical

(b) Give a detailed Statistical Analysis of Split- Plot- Design. (10)

22(a) What limitation of Lattice designs was removed by evolving Partially Balanced Incomplete Block Design? Define a P.B.I.B design with m-associate classes. (5)

(b) Given a PBIB design with parameters $v = b = 9$, $r = k = 4$, $n_1 = n_2 = 4$, $\lambda_1 = 2$, $\lambda_2 = 1$.

The treatments have been numbered from 1 to 9. The blocks are (1358), (2347), (3678), (1269), (1567), (3459), (2468), (1489) and (2579). For the treatments 1, 2 and 5, find the first and second associates. For the treatments 1 and 2, find the p_{jk}^i matrix. Also find it for the treatments 1 and 5. (15)
