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SARDAR PATEL UNIVERSITY
M.Sc. (III Semester) Examination
2012
Thursday, 29th November
2:30 p.m. to 5:30 p.m.
STATISTICS COURSE No. PS03CSTA01
(Design of Experiments)

Note: Figures to the right indicate full marks of the questions. **(Total Marks: 70)**

1 **Attempt all, write correct answers** **08**

(i) The off-diagonal elements in C-matrix of PG(2, s) BIBD is
a) -1/2s b) -1/2
c) -1/s d) -1/(s+1)

(ii) The incidence matrix of BIBD (13, 13, 4, 4, 1) has _____ zero elements.
a) 167 b) 117
c) 52 d) none of these

(iii) How many replication sets of BIBD (9, 12, 4, 3,1) must be considered to construct a PBIB design having two associate class in which each treatment has four first associate treatments occurring together once?
a) 1 b) 3
c) 2 d) 4

(iv) Which method results in symmetric BIBD from an SBIBD?
a) Taking complementary plan b) block section
c) block intersection d) none of these

(v) Connectedness of a design is implied by which of the following
a) balancedness b) orthogonality
c) value of non-zero eigen root d) none of these

(vi) The value of lack of fit degrees of freedom in case of two replicates of 2^4 factorial design is
a) 0 b) 16
c) 1 d) None of these
e)

(vii) The divisor for quadratic effect of a main effect in 3^3 factorial is
a) 4 b) 6
c) 8 d) None of these

(viii) What is the number of confounded interactions in plan of 2^6 in 2^3 block size confounded factorial?

a) 7 b) 3
c) None of these d) 4

2 **Attempt ANY 7, each carries 2 marks** **14**

(a) Obtain E(ESS) for general block design in usual notations.

(b) Check whether (2 3 5) a difference set? If yes, it is of which Galois field?

(c) Show that that for BIBD the characteristic root is $\lambda v/k$ with (v -1) multiplicity.

(d) Rearrange treatments in blocks of so that columns form a RBD (4, 3)

1 2 3
1 2 4
1 3 4
2 3 4

(e) What is the saving in units and gain in efficiency if BIBD(11, 11, 5, 5, 2) is preferred to irreducible BIBD (v=11, k=2) ?

(f) Obtain the estimate of t_1 (treatment 1) in intra block estimation of design with plan (treatments in bracket) and yield given below

(1) 2 (2) 3
(3) 4 (4) 1
(1) 3 (3) 2
(2) 3 (4) 1

(g) Construct MOLS of order 4.

(h) Show that sum of squares due to blocks equal sum of square due to the single confounded factorial effect in case of 2^2 factorial experiment in two blocks.

(i) State and prove two parametric relations of two associate class partially balanced incomplete block design.

(j) Give plan of the smallest Youden square design and the smallest resolvable balanced incomplete block design.

3(a) Show that the most efficient connected, binary design is balanced. Verify this result for BIBD. **06**

3(b) Check whether the design having following plan is connected or not. **06**

{ (A B E), (C D A), (A D E), (B C) }

OR

3(b) Verify whether the design with following plan of allocation of treatments 1 to10 in blocks of size 3 is balanced or not.

1	1	1	2	2	3	5	5	6	8
2	3	4	3	4	4	6	7	7	9
5	6	7	8	9	10	8	9	10	10

4(a) Derive formula for intra block estimate and inter block estimate of treatment effects in case of BIBD. Give your comment about the value of two estimates. **06**

4(b) Define PG(2,s) system and obtain parameters of the corresponding BIBD. Give **06**

list of five BIBDs following from PG(2,s). Construct plan of any one of these BIBDs.

OR

4(b) State and prove inequality about resolvable BIBD.

5(a) Discuss intra block analysis of two associate class PBIB design. **06**

5(b) Explain about Youden square design. Construct a plan of YSD for comparing 7 treatments such that each treatment occurs once in each of the four plot positions. **06**

OR

5(b) Derive formula for estimating one missing observation in BIBD.

6(a) Construct plan of single replicate 2^5 factorial experiment being experimented in four blocks each of size 8, saving main effects and two-factor interactions. **06**

6(b) Write down contrast matrix for 2x2x3 factorial experiment. **06**

OR

6(b) Given key block identify the plan and its confounded interactions. Also obtain the remaining blocks of the factorial experiment.
(1), bc, de, bcde, abd, acd, abe, ace
