[209/210] SEAT No._____ No of Printed pages: 03

SARDAR PATEL UNIVERSITY
M.Sc. (III Semester) Examination
2018
Monday, 22nd October
2.00 pm to 5.00 pm
STATISTICS COURSE No. PS03CSTA01/21
(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) In context of general block design (GBD) row sum of C-matrix is ____
a) 0 b) zero vector
c) Non-negative d) Non negative vector

(ii) Randomized block design (RBD) is orthogonal because its incidence matrix is .....
a) square b) rectangle
c) unit matrix d) none of these

(iii) What is the value of n_1 in case of the smallest two associate PBIBD?
a) 1 b) 3
c) 2 d) 4

(iv) Which method results in a BIBD from an SBIBD with least block size?
a) Complementary design b) block section
c) block intersection d) Taking transpose of incidence matrix

(v) What is the divisor term in estimate of missing data value in BIBD?
a) $\lambda(v-k)(k-1)$ b) $\lambda(v-1)(k-1)$
c) $(\lambda v-k)(k-1)$ d) $\lambda v(k-1)$

(vi) The signs of factorial effects (ab) and (abcd) in AB contrast of 2^4 factorial design are
a) +, + b) +, -
c) -, - d) -, +

(vii) The appropriate fill in the blanks value in statement are: Efficiency factor of SBIBD (s^2+s+1, __, 1) is ____.
a) (s+1), $(s^2+s+1)/(s^2+2s+1)$ b) (s+1), $(s^2+2s+1)/(s^2+s+1)$
c) s, $(s^2+s+1)/(s(s+1))$ d) s, $(s^2+s+1)/(s^2+1)$

(P.T.O.)

(viii) There would be _____ confounded interactions in $2^n - 2^k$ partially confounded factorial experiment.

a) Exactly 2^{n-k}-1
b) At least 2^{n-k}-1
c) More than 2^{n-k}-1
d) n-k

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

(a) Check whether block design { (A B), (C D), (A D), (B C) } is connected or not.

(b) State and prove the necessary condition for BIBD to exist.

(c) State at least two important properties of BIBD.

(d) Construct smallest YSD. What is the formula of its position sum of squares?

(e) Give parameters of complementary design of AR BIBD (16, 20, 5, 4, 1). Is it more efficient than the original design?

(f) Develop SBIBD (7, 4, 2) using difference set (2 3 5).

(g) Show in usual notation that single missing value in GBD is estimated as $\hat{x} = B\hat{\theta}$.

(h) State parametric relations of partially balanced incomplete block design relating incidence matrix with association matrices.

(i) Give ANOVA table of two replicates of 2^3 factorial design.

(j) Explain balanced confounding.

3(a) In usual notation carry out parametric estimation in analysis of general block design. **06**

3(b) State and prove the necessary and sufficient condition to check whether a block design is balanced or not. Apply it on { (1 2 5), (1 3 4), (1 4 5), (2 3) }. **06**

OR

(b) Show that $-CR^{-1}N = 0$ matrix of order vxb is the necessary and sufficient condition for a block design to be orthogonal. Justify this statement through an example.

4(a) What is recovery of inter block information? Discuss inter block estimation of treatment effects in case of BIBD. **06**

4(b) Discuss SIX salient features of SBIBD with justification. **06**

OR

(b) State and prove inequality about resolvable BIBD.

5(a) Starting with reduced normal equations for general block design under fixed effect model, carry out estimation of treatment effects in case of two associate PBIBD. **06**

5(b) Define Youden square design. Write down ANOVA tables of BIBD and YSD and make comparison. **06**

OR

(b) Define two associate class PBIBD. Write down its useful parametric relations. Fill in the blanks so that the following 4-blocks block design becomes a PBIBD.

Write down its parameters as per PBIBD definition.

6(a) Construct Resolution III, IV and V designs fully. Give comments. **06**

6(b) Suppose 2^3 factorial is conducted using a BIBD having r replications, b blocks, k block size and λ pair occurrences. Write down ANOVA table for this design. **06**

OR

(b) Discuss about three types of confounding used in factorial experiments. Explain using example of 2^5 factorial in 2^3 block size.