2/41

2111E737

Candidate's Seat No :_____

M.Sc Sem-3 Examination

502

Statistics

Time : 2-30 Hours] **November-2024** **[Max. Marks : 70**

Note: Attempt all questions.

Q.1

(i) Discuss general structure of block designs. [7]

(ii) In usual notations for a block design, show that $b + \text{rank}(C) = v + \text{rank}(D)$. [7]

OR

(i) Show that an incomplete block design is connected if and only if the rank of its C-matrix is exactly v - 1. [7]

(ii) Show that a connected design is balanced if and only if all the non-zero characteristic roots of C are equal. [7]

Q.2

(i) Define BIBD (v,b,r,k,λ) and show that for BIBD $r(k-1) = \lambda(v-1)$. [7]

(ii) Show that for a resolvable BIBD (v,b,r,k,λ) $b \geq v+r-1$. [7]

OR

(i) In usual notations, show that in intrablock analysis of BIBD [7]

$$Q_i = T_i - \sum_{j=1}^{b} \frac{n_{ij} B_j}{k}.$$

(ii) Define BIBD (v,b,r,k,λ) and show that for BIBD $b \geq v$. [7]

Q.3

(i) Define association scheme with m classes. Describe relations between the parameters of PBIB designs. [7]

(ii) What do you understand by fractional replication? Construct a ½ replication of a 2^6-design. [7]

OR

(i) Define a PBIBD with m associate classes and show that in a PBIBD [7]

(A) $\sum_{i=1}^{m} n_i = v-1$ (B) $\sum_{i=1}^{m} n_i \lambda_i = r(k-1)$.

(ii) Construct a 2^5 factorial design in blocks of 8 plots confounding the interactions ACD and BDE. Determine the other interactions which are also confounded. [7]

Q.4

(i) Construct partially balanced incomplete block design using double triangle. [7]

(ii) Define Galois field and construct BIBD with parameters v = 7, b = 7, r = 3, k = 3, $\lambda = 1$. [7]

OR

(i) Define mutually orthogonal Latin squares(MOLS). Explain, how will you obtain a BIBD using MOLS. [7]

(ii) Construct BIBD with parameters v = 15, b = 35, r = 7, k = 3, $\lambda = 1$. [7]

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E737-2

Q. 5 Answer any seven [14]

(i) Latin square designs are

(A) orthogonal (B) connected (C) both (A) and (B) (D) none of the above

(ii) In a connected design the diagonal elements of the C-matrix are all positive.

(A)True (B) False

(iii) For an incomplete block design, $CE_{v,1}$ = ----------?

(A) $\mathbf{0}_{v,1}$ (B) $\mathbf{1}_{v,1}$ (C) $r\mathbf{1}_{v,1}$ (D) $k\mathbf{1}_{v,1}$

(iv) Define symmetric BIBD.

(v) Define affine resolvable design.

(vi) In usual notations, in intrablock analysis for BIBD , treatment sum of squares (adjusted) is given by

(A) $\sum_{i=1}^{v} \frac{Q_i^2}{rE}$ (B) $\sum_{i=1}^{v} \frac{Q_i^2}{\lambda E}$ (C) $\sum_{i=1}^{v} \frac{Q_i^2}{bE}$ (D) $\sum_{i=1}^{v} \frac{Q_i^2}{2bE}$

(vii) In usual notations a group-divisible design is said to be semiregular if _____.

(viii) In a PBIBD with $v = 6,\ r = 2, k = 4, b = 3, m = 3, n = 2, \lambda_1 = 2, \lambda_2 = 1$, value of P_{22}^2 is

(A) 0 (B) 4 (C) 1 (D) 2

(ix) Give one disadvantage of confounding.

(x) Define PG (n, s).

(xi) Find primitive element of GF(5).

(xii) Give incidence matrix of BIBD v = 5, b = 10, r = 6, k = 3, $\lambda = 3$.

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