Seat No. : _____

ND-141

December-2015

M.Sc., Sem.-III

502 : Statistics
(Design of Experiment)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) **All** questions carry equal marks.
(2) Attempt **all** questions.

1. (a) Discuss analysis of general block designs in brief.

OR

In usual notations for a block design, prove that

$b + \text{rank}(c) = v + \text{rank}(D)$. Verify this for following block design :

Block		
I	A	B
II	C	D

(b) Discuss analysis of two way designs in brief.

OR

State and prove the necessary and sufficient condition for a block design to be orthogonal.

2. (a) Check whether the design with incidence matrix $N = E_{33}$ is connected, balanced and orthogonal.

OR

Show that BIBD (v, b, r, k, λ) is a connected design but not orthogonal.

(b) If a BIBD (v, b, r, k, λ) exists then show that

(i) $r(k - 1) = \lambda(v - 1)$

(ii) $b \geq v$

OR

Discuss Intra block analysis of variance of a BIBD.

3. (a) Define SBIBD (ν, r, λ). Prove that in SBIBD (ν, r, λ), there are λ treatments common between any two blocks.

OR

If ν, b, r, k, n_i, λ_i, i = 0, 1, 2, … n are parameters of PBIBD then in usual notations show that

(i) $\sum_{i=0}^{m} n_i \lambda_i = rk$ (ii) $n_i P_{jk}^{i} = n_j P_{ik}^{j} = n_k P_{ji}^{k}$

(b) Define RBIBD $(\nu = nk, b = nr, r, k, \lambda)$ and show that for RBIBD, $b \geq \nu + r - 1$.

OR

Construct PBIBD using a 'CUBE'.

4. (a) Define 2^m and 3^m factorial designs. Describe Yates' method for a 2^m factorial design. Discuss concept of confounding in factorial designs.

OR

Construct a 2^5 factorial design in blocks of 8 plats confounding the interactions ACD and BDE. Determine the other interactions which are also confounded.

(b) Define GF(p^n). Construct GF(5).

OR

Discuss various methods of constructing BIBD.

5. Answer following in brief : (any **seven**)

(1) For a block design in usual notations show that
(i) $E_{Iv}\underline{Q} = 0$ (ii) $E_{Ib}\underline{P} = 0$

(2) Define :
(i) Elementary Treatment Contrast
(ii) Normalized Treatment Contrast.

(3) For a BIBD (ν, b, r, k, λ), show that $r > \lambda$.

(4) Define Affine Resolvable BIBD. State whether following is ARBIBD.
$\nu = 6, b = 10, r = 5, k = 3, \lambda = 2$.

(5) Define Youden square design. Explain the relationship of this design with
(i) BIBD (ii) LSD

(6) State the difference between PG (N, S) and EG (N, S).

(7) What is meant by 'm-class association scheme' ?

(8) Define a complete set of Mutually Orthogonal Latin Squares (MOLS). State how MOLS of side 3 can be constructed ?

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