22STU622

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Sixth Semester)

Branch – **STATISTICS**

DESIGN OF EXPERIMENTS

Time: Three Hours | Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 Which of the following is not an assumption of ANOVA
(i) The observations are independent
(ii) Parent population is normal
(iii) Various effects are additive in nature
(iv) The effects are multiplicative in nature

2 Identify the distribution of residuals
(i) $N(0,\sigma^2)$ (ii) $N(1,\sigma^2)$
(iii) $N(0,1)$ (iv) $N(n,\sigma^2)$

3 Recall the error df of 2^2 factorial design
(i) 4r-1 (ii) 3(r-1)
(iii) 3r-1 (iv) r-1

4 What is the error df of 2^2 factorial design?
(i) 4r-1 (ii) 3(r-1)
(iii) 3r-1 (iv) r-1

5 What are the conditions for a BIBD to be symmetric?
(i) b=v and r=k (ii) b=r and v=k
(iii) b<v and r<k (iv) b>v and r>k

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Explain the principles of Design of Experiments
OR
b With an example, brief about fixed effect model and Random effect model.

7 a Write the advantages and disadvantages of RBD
OR
b Explain Standard Latin Square with example.

8 a Give expressions for calculating the sum of squares due to main effects and interaction in 2^2 factorial experiment.
OR
b What do you mean by contrasts. When they are orthogonal?

9 a Develop the layout of a 2^3 system in blocks of four units. Give the ANOVA table.
OR
b Give the layout of 2^5 system in four blocks.

10 a Derive the efficiency of BIBD over RBD
OR
b State and Prove any two relationships between the parameters of BIBD.

Cont...

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Explain the partition of sum of squares of two way classification.

OR

b Derive the expectation of treatment sum of squares and error sum of squares and hence write the ANOVA for One way classification.

12 a Explain the partitioning of total sum of squares and hence explain the statistical analysis of CRD.

OR

b Derive the efficiency of RBD relative to CRD.

13 a Explain the statistical analysis of 2^3 factorial design by clearly specifying the degrees of freedom in the ANOVA table.

OR

b Explain Yates method for computing factorial effect totals for a 2^3 factorial experiments.

14 a Derive the ANOVA of a 2^3 system in which the highest order interaction is confounded – Illustrate.

OR

b Arrive at the ANOVA for 3^2 system with total confounding.

15 a Explain the main plot analysis and sub plot analysis of a Split Plot design and hence write the ANOVA.

OR

b Explain the Intrablock analysis of BIBD.

Z-Z-Z END