

**2025/FYUG/ODD/SEM/
STADSC-302T/044**

FYUG Odd Semester Exam., 2025

STATISTICS

(5th Semester)

Course No. : STADSC-302T

(Linear Models and Design of Experiments)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Answer any *two* from the following : 2×2=4
 - (a) Define parametric function and estimable function.
 - (b) Define analysis of variance (ANOVA).
 - (c) State the assumptions and hypothesis of one-way ANOVA.

2. Answer any *one* from the following : 10
 - (a) (i) State and prove Gauss-Markov theorem. 6

(3)

UNIT—III

- (ii) Write a note on critical difference (CD).
(b) Describe the analysis of variance in two-way classified data with one observation per cell for fixed effect model.

UNIT—II

3. Answer any two from the following :
(a) Define treatment in reference to an experiment.
(b) Define experimental error.
(c) Explain the term 'local control' in design of experiments.
4. Answer any one from the following :
(a) What is Completely Randomized Design (CRD)? Explain the complete statistical analysis of completely randomized design (CRD) starting from an appropriate mathematical model. Also write the applications of CRD.
(b) What is Randomized Block Design (RBD)? Discuss the analysis of RBD starting from mathematical model and estimating its parameters.

4 5. Answer any two from the following : $2 \times 2 = 4$

- (a) Mention two advantages of using factorial design.
(b) Write down the main effects and interaction effects of 2^3 -factorial experiment.
(c) State the advantages of confounding.

10 6. Answer any one from the following : 10

- (a) Define factorial experiment (FE). Give the complete analysis of 2^3 -factorial experiment in RBD.
(b) Define confounding. Distinguish between partial and total confounding.

UNIT—IV

7. Answer any two from the following : $2 \times 2 = 4$

- (a) Define incidence matrix of a BIBD.
(b) What do you mean by symmetric BIBD?
(c) What is fractional factorial experiment?

8. Answer any *one* from the following : 10

(a) Define Balanced Incomplete Block Design (BIBD). Interpret the necessary conditions of BIBD. 2+8=10

(b) Obtain Fisher's inequality $b \geq v$ for a BIBD. (Symbols hold their usual meanings.) 10

UNIT—V

9. Answer any *two* from the following : 2×2=4

(a) What is missing plot technique?

(b) Define analysis of covariance.

(c) What are the assumptions and hypothesis of analysis of covariance in two-way classified data?

10. Answer any *one* from the following : 10

(a) Explain the procedure of obtaining the estimate of one missing observation in RBD and also with the ANOVA table for the same.

(b) Describe the analysis of covariance for one-way classified data.

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