



**2023/TDC (CBCS)/EVEN/SEM/
STSHCC-402T/271**

TDC (CBCS) Even Semester Exam., 2023

STATISTICS

(Honours)

(4th Semester)

Course No. : STSHCC-402T

(Linear Models)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

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

SECTION—A

Answer any *ten* of the following : 2×10=20

1. Define analysis of variance fixed effect model.

2. Define a parametric function and an estimable function.



(2)

3. Define BLUE.
4. Define the simple linear regression model along with the assumptions associated with it.
5. What are the statistical properties of the estimated parameters under the simple linear regression model?
6. Write down the formula of the estimated parameters of the simple linear regression model.
7. Define analysis of variance.
8. Define fixed effect and random effect models.
9. Give the mathematical model for one-way classification.
10. Give the model for two-way classification of analysis of variance using fixed effect model along with the assumption made therein.
11. Define mean sum of squares for analysis of variance for two-way classification.
12. Define analysis of covariance.

J23/642

(Continued)

(3)

13. Define homoscedasticity.
14. Define multicollinearity.
15. What is the effect of violation of normality assumptions?

SECTION—B

Answer any *five* of the following questions : 6×5=30

16. Define the Gauss-Markov linear model. What are the different models that can be derived from it? Explain.
17. Prove the necessary and sufficient condition for the linear function $L'\beta$ of the parameters to be linearly estimable is $\text{Rank}(A) = \text{Rank} \begin{pmatrix} A \\ L' \end{pmatrix}$, where $\begin{pmatrix} A \\ L' \end{pmatrix}$ is the matrix obtained from A by adjoining the row vector L' . Symbols hold their usual meanings.
18. Define the simple linear regression model and estimate its parameters.

J23/642

(Turn Over)



19. Show that the estimated parameters of the simple linear regression model are unbiased and linear. Also estimate the variance of any one of the estimated parameters.
20. Give the analysis of variance for one-way classified data.
21. Obtain the expectation of sum of squares for between variation and within variation for one-way analysis of variance and hence show that under null hypothesis expectation of mean squares provide unbiased estimates of error variance.
22. Give the analysis of variance for two-way classified data.
23. Discuss the analysis of covariance for two-way classified data.
24. Discuss any one method of checking collinearity.
25. Discuss in detail the effect of violation of normality assumptions.

★ ★ ★

2023/TDC (CBCS)/EVEN/SEM/
STSHCC-402T/271

J23—100/642