24P355 (Pages: 2) Name……………………..

Reg. No…………………..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC22PMST3C09 - APPLIED REGRESSION ANALYSIS

(Statistics)

(2022 Admission onwards)

Time : Three Hours   Maximum : 30 Weightage

PART A

Answer any *four* questions. Each question carries 2 weightage.

1. What are outliers? What will happen to the regression models if the data contain outliers?

2. Explain multicollinearity and serial correlation in regression model.

3. What is a dichotomous variable? Give an example.

4. What is stepwise regression?

5. Distinguish between population regression model and sample regression model.

6. Define coefficient of determination.

7. Discuss the assumptions of Poisson regression model.

(4 × 2 = 8 Weightage)

PART B

Answer any *four* questions. Each question carries 3 weightage.

8. Let $Y_1 = \theta + \varepsilon_1$

   $Y_2 = 2\theta - \phi + \varepsilon_2$

   $Y_3 = \theta + 2\phi + \varepsilon_3$,

   where $E[\varepsilon_i] = 0$ (i = 1, 2, 3). Find the least square estimates of θ and ϕ.

9. Let $Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$ (i = 1, 2, ..., n), where $E[\varepsilon] = 0$ and $Var[\varepsilon] = \sigma^2 I_n$. Find the least square estimates of β_0 and β_1. Prove that they are uncorrelated if and only if $\bar{x} = 0$.

10. Explain the non-parametric regression model and the parameter estimation procedure.

11. Describe the maximum likelihood method for the estimation of parameters of multiple linear regression and write the properties of estimates.

12. For the simple linear regression model derive the properties of the least square estimators and the fitted regression model.

13. Explain extra-sum-of-squares method. How it can be used to investigate the contribution of a subset of the regressor variables to a multiple linear model?

14. Discuss logistic regression models. How will you estimate the parameters in this model?

(4 × 3 = 12 Weightage)

PART C
Answer any *two* questions. Each question carries 5 weightage.

15. Explain the different methods for model adequacy checking.

16. Let $Y_i = \beta_0 + \beta_1 x_{i1} + \ldots + \beta_{p-1} x_{i,p-1} + \varepsilon_i$, $i = 1, 2, \ldots, n$, where the ε_i are independent $N(0, \sigma^2)$. Prove that the F-statistic for testing the hypothesis $H : \beta_q = \beta_{q+1} = \cdots = \beta_{p-1} = 0$, $(0 < q \leq p-1)$ is unchanged if a constant, c, say, is subtracted from each Y_i.

17. (a) What is the need of piecewise polynomial fitting? Discuss the method of splines in this context.

(b) Describe Mallow's C_p statistic and explain its theoretical background.

18. What are the components of general linear model? Give one example each for normal, binomial and Poisson models.

(2 × 5 = 10 Weightage)

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