THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P MST3 C11 / CC22P MST3 C09 – APPLIED REGRESSION ANALYSIS

(Statistics)

(2019 Admission onwards)

Time: Three Hours   Maximum: 30 Weightage

PART A

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

1. Briefly explain the uses of regression.

2. Consider the linear model $y = \beta_1 X_1 + \beta_2 X_2 + \varepsilon$, $E(\varepsilon) = 0$, $V(\varepsilon) = I$, where the study variable y and the explanatory variables X_1 and X_2 are scaled to length unity and the correlation coefficient between X_1 and X_2 is 0.5. Let b_1 and b_2 be the ordinary least squares estimators of β_1 and β_2 respectively. Find the covariance between b_1 and b_2.

3. What is the importance of studentized and PRESS residuals in model adequacy checking?

4. What is the R^2 statistic? What does it signify?

5. Write short note on piecewise polynomial fitting.

6. Distinguish between general linear models and generalized linear models.

7. What is Poisson regression?

(2 × 4 = 8 Weightage)

PART B

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

8. Develop the likelihood ratio test for hypothesis concerning the parameters of a linear regression model having $H_0 : \beta = \beta^0$, where $\beta = (\beta_1, \beta_2, ..., \beta_p)$' and $\beta^0 = (\beta_1^0, \beta_2^0, ..., \beta_p^0)'$, is specified and σ^2 is unknown. Assume that all β ` s are estimable, and $rank(X) = p$ (full column rank).

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

10. Distinguish between Leverage point and influential observations and explain the detection procedures used in both situations.

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

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

13. From a study conducted by the Department of transportation on driving speed and mileage for midsize automobiles, following results are obtained:

Driving speed (x)	30	50	40	55	30	25	60	25
Mileage (y)	28	25	25	23	30	32	21	35

Fit a linear regression model for the mileage and interpret the result.

14. Explain the purpose of non-parametric regression models. Discuss about the Kernel and Locally weighted regression models.

(3 × 4 = 12 Weightage)

PART C

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

15. State and prove Gauss – Markov theorem.

16. What do you meant by variable selection problem? Discuss the criteria for evaluating subset regression models.

17. Describe how orthogonal polynomials can be used in the inference problems associated with a polynomial regression model.

18. Derive the maximum likelihood estimator of generalized linear model.

(2 × 5 = 10 Weightage)

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