PG Even Semester Examination, May 2025

STATISTICS

2nd Semester

Course No. : STS - 552

(Linear Models and Regression)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer five questions taking one from each unit)

Unit - I

1. (a) Define regression analysis. Assuming two variable regression model $y=\alpha+\beta x+u$, find the least square estimates of the parameters α and β. Also obtain the estimates of $v(\hat{\alpha})$ and $v(\hat{\beta})$. 2+4+4+4=14

2. (a) What do you mean by coefficient of determination? Obtain coefficient of determination for two variables. 8

   (b) Discuss the followings 2+2+2=6

   (i) outliers

   (ii) leverage and

   (iii) influential points.

(Turn Over)

Unit - II

3. Define generalized least square (GLS) method. Also estimate α^* and β^* 2+12=14

4. Discuss the k-variable linear regression model. Also write down the assumptions of linear regression model. 7+7=14

Unit - III

5. (a) Consider the two-variable regression model, $y_i = \beta_1 + \beta_2 x_i + u_i$, with E $(u_i, u_j) \neq 0$ for $i \neq j$ and u_i has first order autoregressive scheme, then show that

   i) $E(u_i) = 0$

   ii) $v(u_i) = \dfrac{\sigma_i^2}{1-\rho^2}$

   iii) $\text{cov}(u_i, u_{i+s}) = \rho^2 \dfrac{\sigma_i^2}{1-\rho^2};\ s \neq 0$ 10

   (b) Discuss ridge regression model. 4

6. (a) Explain clearly the method of centralling of regression line. 9

   (b) Define auto-correlation. What are the causes of auto correlation? 5

Unit - IV

7. Mention any five differences among linear and non-linear regresson models. Describe assumptions of GLMs. 8+6=14

8. Define growth model and derive the models for logistic and Gompertz models. 14

Unit - V

9. Derive the mean and variance of binomial and normal distribution by using their link functions. 7+7=14

10. Define different types of logistic regression models and their assumptions. 14

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