SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc. - END SEMESTER EXAMINATIONS APRIL - 2022
SEMESTER - II
21PBSCT2005 - Applied Regression Analysis

Total Duration : 3 Hrs.   **Total Marks : 60**

Section A

Answer any **SIX** questions $(6 \times 5 = 30$ Marks$)$

1. Under usual notations, develop the 'interval predictor' of a new observation in a simple regression model.

2. The ANOVA table for testing overall significance of the model coefficients is given below. Determine the missing entries

Source of Variation	Sum of Squares	Degrees of Freedom	Mean sum of Square	F - Ratio
Regression	?	3	47	?
Error	1643	?	?	
Total	?	139		

   Also Estimate the R^2 and adjusted R^2 using the above ANOVA table.

3. Explain 'General Linear Hypothesis' and develop the F-test for it. For a linear model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$, develop the test for the linear hypothesis H_0: $\beta_2 = \beta_3$.

4. Give the motivation for 'Generalized Least Squares' and discuss the estimation of the regression parameters and ANOVA. Discuss WLS and the issues related to using WLS.

5. Describe the 'Forward Model Building' algorithm clearly specifying the partial-F statistics and tests applied

6. Explain the Box-Cox class of power transformations

7. Explain the method of detecting multicollinearity using VIF and conditional Index.

8. Explain Non-parametric regression through 'Kernel Smoothing'

Section B

Part A

Answer any **TWO** questions $(2 \times 10 = 20$ Marks$)$

9. Discuss the t-test and ANOVA approach to test for significance of the slope coefficient in a simple (single regressor) regression model with intercept.

10. Obtain the Least squares estimator of Multiple Linear Regression coefficients.

11. Define the Durbin-Watson Statistic to test for first order auto correlation in error terms of a model. Apply it to the following series of time-ordered residuals obtained by OLS for a model with 3 regressors:
4.818, -10.364, 4.454, -0.727, 4.091, -1.092, -6.272, 3.546, 8.364, -6.818
The relevant DW bounds are given to be $d\text{L} = 0.34$, $d\text{U} = 1.733$.

12. Give a brief note about 'Ridge Regression' with example.

Part B

Compulsory question $(1 \times 10 = 10$ Marks$)$

13. Distinguish between hierarchical and non-hierarchical polynomial models. Also Bring out any four specific aspects considered in fitting polynomial regression models.

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