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Sardar Patel University
External Examination (ATKT)
M.Sc. Statistics Semester II
PS02CSTA02:Linear Models and Regression Analysis
December 03, 2012, Monday
Time: 10:30 a.m. to 01:30 p.m.

Marks:70

Q1. **Multiple Choice Questions.** 08

1. In ANCOVA model the measurement scale of study variable is
   (a) Nominal (b) Interval (c) Ordinal (d) None of the above
2. In ANOVA the predictor variable must be _____.
   (a) Qualitative (b) Quantitative (c) both (a) and (b) (d) Binary
3. Among the selection of two nested models we use _____as a goodness of fit measure.
   (a) Variance of Regression Coefficients (b) Coefficient of Determination (c) AIC and SIC (d) all (a) to (c)
4. In Ridge Estimation, an estimator is
   (a) Product of OLS estimator (b) Orthogonal to OLS estimator (c) Linear Combination of OLS estimator (d) Linear Contrast of OLS estimator
5. In the context of Mulitcolinearity if VIF is more than 10 indicate that the correlation among auxiliary regressors is:
   (a) equal to 0.5 (b) equal to 0.7 (c) less than 0.5 (d) more than 0.95
6. $Y_i = \beta_1 + \beta_2 (1/X_i) + u_i$ is as known as_____.
   (a) Nonlinear model (b) reciprocal model (c) logarithmic model (d) weighted model
7. The model with p regressors' is adequate in that sense it does not suffer from lack of fit if C_p is about _____.
   (a) less than p (b) greater than p (c) equal to p (d) can't say
8. In case of non full rank model the O!.S estimator of $\underline{\beta}$ is given by
   (a) $\underline{\hat{\beta}} = (X'X)^{-1}X'\underline{y}$ (b) $\underline{\hat{\beta}} = (X'X)'X'\underline{y}$ (c) $\underline{\hat{\beta}} = \bar{S}X'\underline{y}$ (d) None of the above

Q2. **Short Answer Type Question (Any Seven)** 14

1. Define Error Space and Estimation Space. Also Show that they are orthogonal to each other.
2. Give the full name of AIC, BIC and SIC. Also, give their interpretation.
3. Define Scheffe's simultaneous confidence interval and give its need in GLM.
4. List the rules of thumbs for detection of multicolinearity.
5. In usual notation, give the distribution of SSE and give its role in General Linear Model.
6. What do you mean by intrinsically linear models? Give at least two examples of it.
7. Define Ridge Estimator. Show that it is a biased for parameter.
8. State all necessary and sufficient conditions for parametric function to be estimable.
9. Distinguish between leverage point and influential point.
10. Distinguish between standardized residuals and studentized residuals.

Q3(a) State and Prove Gauss Markov theorem 06

(b) Show in usual notation, the conditional SSE of the residual $\left(\underline{y} - X\underline{\beta}\right)'\left(\underline{y} - X\underline{\beta}\right)$ on the General Linear Model subject to condition $\Lambda\underline{\beta} = \underline{d}$, where $\Lambda\underline{\beta}$ is estimable and $Rank(\Lambda) = m$, exceed the unconditional SSE by a quantity which is a quadratic form in the blues of parametric functions. 06

[OR]

(b) Explain the linear model with various examples. 06

Q4(a) Discuss nonlinear models. 06

(b) Explain the ANCOVA Model in detail. 06

[OR]

(b) Derive the distribution of Regression Sum of Squares in context of linear model. 06

Q5(a) Explain VIF, Conditional Index and Tolerance with reference to multicolinearity.

(b) Explain the remedial measures for multicolinearity. 06

[OR]

(b) Discuss multiple linear regressions. 06

Q6(a) Explain methods of testing significance of regression coefficients in simple linear regression. 06

(b) Discuss Mallow's C_p criterion. 06

[OR]

(b) Discuss Residual Analysis. 06

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