



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## M.Sc. DEGREE EXAMINATION - STATISTICS

FIRST SEMESTER – NOVEMBER 2013

### ST 1821 - APPLIED REGRESSION ANALYSIS

Date : 08/11/2013  
Time : 1:00 - 4:00

Dept. No.

Max. : 100 Marks

#### SECTION - A

Answer ALL the Questions

(10X2=20Marks)

Answer all the Questions

1. State any two applications of Multiple Linear Regression model
2. What is the consequence of introducing m dummy variables for a categorical variable taking m categories in a multiple linear regression with intercept?
3. What is the use of Adjusted R-square?
4. Write down the multiple linear model equation and interpret the model coefficients based on the given information

$$(X'X)^{-1} = \begin{bmatrix} 2 & 6 & -2 \\ 6 & 7 & -4 \\ -2 & -4 & 3 \end{bmatrix}, X'Y = \begin{bmatrix} 3 \\ 7 \\ 10 \end{bmatrix}$$

5. Define PRESS statistic
6. State any two consequences of Multicollinearity
7. Define General Linear Model(GLM)
8. State the purpose of differencing a time series
9. Define plot of Auto correlation Function(ACF)
10. Define plot of Partial Auto correlation function(PACF)

#### SECTION - B

Answer any FIVE questions

(5X8=40Marks)

Answer any FIVE questions

11. a. The ANOVA table for testing overall significance of the model coefficients is given below. Determine the missing entries (4+4)

Source	SS	d.f	MSS	F
Model	?	3	47	?
Error	1643	?	?	
Total	?	139		

- b. Let  $k=4$ ,  $n=160$ ,  $TSS=890$ ,  $ESS=130$  determine the value of  $R^2$  and Adjusted  $R^2$

12. a. Define Interaction effect (2+6)  
b. Illustrate with an example how the interaction effect between two categorical explanatory variable is captured by the coefficient of the cross product term?
13. a. Explain spline regression with an example (4+4)  
b. Explain  $R^2$  and Adjusted  $R^2$  and explain their uses
14. a. Explain the method of testing for overall significance of model coefficients(6+2)

- b. Explain the method of testing individual regression coefficients
15. Explain the method of detecting Multicollinearity using VIF and Conditional Index
16. a. State the assumptions of a OLS regression model. (5+3)  
b. Explain variance stabilizing transformations.
17. Explain Graphical method, Spearman's Rank Correlation method and White's.  
General Heteroscedasticity Test for detecting heteroscedasticity . (2+3+3)

### SECTION - C

**Answer any TWO questions**

**(2X20=40Marks)**

18. Explain the following model building procedures.
- a. Forward Selection (4)  
b. Backward Elimination (4)  
c. Stepwise procedure (4)  
d. Best Subset procedure (4)  
e. All-possible subset procedure (4)
19. a. Explain in detail the methods of detecting outliers. (10+10)  
b. Obtain the Least squares estimator of Multiple Linear Regression coefficients.
20. a. Explain the methods of model validation . (10)  
b. Explain the methods to overcome Multicollinearity. (5)  
c. Explain the methods to overcome Heteroscedasticity. (5)
21. a. Define AR(p), MA(q), order of integration(d). (9+5+6 )  
b. Explain the test for stationarity.  
c. Explain BOX Jenkins methodology of constructing a ARIMA model.

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