LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - STATISTICS

FIRST SEMESTER – APRIL 2013

ST 1816/1821 - APPLIED REGRESSION ANALYSIS

Date : 30/04/2013 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

Part-A

Answer all the questions: (10x2=20)

1) Define PRESS Statistic.

2) State any two assumptions of a linear model.

3) Write the unbiased estimator for σ^2 in a linear regression model.

4) Explain studentized residual.

5) Give the expression for a generalized least square estimator explaining the notations.

6) Explain MA (q) model.

7) Explain any two ways of removing multi collinearity.

8) How will you make the model, $y=\beta_0 \ e^{\beta_1 x}$ as a linear model? Explain.

9) How should one choose the order of the polynomial model?

10) Define an outlier.

Part-B

Answer any 5 questions: (5x8=40)

11) Explain unit normal and unit length scaling.

12) Explain homosedasticity and weighted least squares.

13) Explain the method of finding multi collinearity using characteristic roots of X'X and singular values of X.

14) An investigator has the following data

X	1	2	3	4
Y	1.2	1.8	2.3	2.5

Decide whether $Y=\beta_0+\beta_1 X$ or $Y^2=\beta_0+\beta_1 X$ is more appropriate.

15) Explain cubic splines.

16) The average price of pork (Y) for each quarter for 3 years is given below. Write the linear model with intercept. Construct the data matrix using dummy variables for the quarter.

Quarter	Price in $
1	28.23
2	23.53
3	22.12
4	15.69
1	19.43
2	17.43
3	19.05
4	19.39
1	20.4
2	19.5
3	20.6
4	16.6

17) Explain ridge regression in detail.

18) Explain non-parametric regression.

Part-C

Answer any 2 questions: (2x20=40)

19) a) Explain the residual plots in detail. (12)
b) Explain partial F-test and testing general linear hypothesis. (8)

20) Based on a sample of size 16, a model is to be built with 4 regressions. Carry out the forward regression method to decide on the significant regressors at each iteration, given the following information.

SS_T=1810.509
$SS_{Res}(x_1)$ = 843.8
$SS_{Res}(x_2)$ = 604.224
$SS_{Res}(x_3)$ = 1292.923
$SS_{Res}(x_4)$ =589.24
$SS_{Res}(x_1, x_2)$ =38.6
$SS_{Res}(x_1, x_3)$ =818.04
$SS_{Res}(x_1, x_4)$ =49.8
$SS_{Res}(x_2, x_3)$ =276.96
$SS_{Res}(x_2, x_4)$ =579.23
$SS_{Res}(x_3, x_4)$ =117.1
$SS_{Res}(x_1, x_2, x_3)$ =32.1
$SS_{Res}(x_1, x_2, x_4)$ =31.98
$SS_{Res}(x_1, x_3, x_4)$ =33.89
$SS_{Res}(x_2, x_3, x_4)$ =49.2
$SS_{Res}(x_1, x_2, x_3, x_4)$ =31.91

21) Suppose theory suggested that annual income (Y) depended on sex (S), educational qualification (D) and years of experience.
Define,
D_1=1 if highest qualification is SSLC or less; 0 otherwise
D_2=1 if highest qualification is UG or higher; 0 otherwise
S_1=1 if a person is a man; 0 otherwise
S_2=1 if a person is a woman; 0 otherwise
E= years of experience
The following equation is obtained for 25 observations,

$$Y=7000- 2000S_2+ 6000D_2+ 500E+ 1600S_2D_2 - 200S_2 E+ \epsilon$$
(1200) (2000) (150) (500) (150)

R^2=.78, n=25. The standard errors of the regression coefficients are given in brackets.
i) What is the estimated salary for a woman with no college degree and no experience? (2)

ii) What is the estimated salary for a woman with a college degree and 10 years of experience? (2)

iii) Does getting a college degree significantly (α= .05) increase the expected salary for men?.Test the suitable hypothesis. (3)

iv) How much does a woman gain in expected salary from earning an advanced degree? (2)

v) Do women get a significantly different (α= .05) salary increase from earning an advanced degree than men? Test the suitable hypothesis. (3)

vi) Do women get significantly (α= .05) different income raises for years of experience than men? Test the suitable hypothesis.(4)

vii) Test whether all the regression coefficients are zero using F test based on R^2. (4)

22 a) Explain Durbin-watson test. How will you proceed if the hypothesis is rejected?

b) Explain the following tools used to study stationarity

i) graphical method

ii) autocorrelation function, partial auto correlation function

iii) unit root test

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