LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

FIRST SEMESTER – NOVEMBER 2007

ST 1812 - STATISTICAL COMPUTING - I

BB 8

Date : 05/11/2007 Dept. No. Max. : 100 Marks
Time : 1:00 - 4:00

Answer the following questions. Each question carries 33 marks

1. Find the characteristic roots and vectors of the following matrix and also obtain the matrix **U** such that $\mathbf{U}^T\mathbf{A}\mathbf{U} = \mathbf{\Lambda}$:

$$\mathbf{A} = \begin{bmatrix} 6 & 2 & -2 \\ 2 & 6 & -2 \\ -2 & -2 & 10 \end{bmatrix}$$

Write the quadratic form associated with the matrix. Find the rank, index and signature.

(OR)

Find the inverse of the following matrix using partitioning method or sweep out process:

$$\mathbf{A} = \begin{bmatrix} 1 & -1 & 2 & -1 \\ -1 & 3 & 4 & 2 \\ 2 & 4 & 3 & 1 \\ -1 & 2 & 1 & 1 \end{bmatrix}$$

2. The Transient Point (in volts) of PMOS_NMOS Inverters is believed to depend on the length of PMOS and NMOS devices. Build a model with intercept using the following data:

Transient Point (volts)	Length of PMOS device	Length of NMOS device
0.29	8	8
0.20	4	6
4.71	5	5
9.10	4	4
1.37	8	5
0.29	3	3
9.17	8	3
0.38	2	2
3.35	3	3
0.20	2	3
4.97	2	2
1.52	8	6

Test for overall significance of the model. Also test for the significance of the individual regressors.

(OR)

(a) A model with a maximum of four regressors is to be built using a sample of size 30. Carry out 'Backward Elimination Process' to decide the significant regressors given the following information:

$SS_T = 5431.52$, $SS_{Res}(X_1) = 2531.36$, $SS_{Res}(X_2) = 1812.67$, $SS_{Res}(X_3) = 3878.80$, $SS_{Res}(X_4) = 1767.72$, $SS_{Res}(X_1, X_2) = 115.80$, $SS_{Res}(X_1, X_3) = 2454.14$, $SS_{Res}(X_1, X_4) = 149.52$, $SS_{Res}(X_2, X_3) = 830.88$, $SS_{Res}(X_2, X_4) = 1737.76$, $SS_{Res}(X_3, X_4) = 351.48$, $SS_{Res}(X_1, X_2, X_3) = 96.22$, $SS_{Res}(X_1, X_2, X_4) = 95.94$, $SS_{Res}(X_1, X_3, X_4) = 101.66$, $SS_{Res}(X_2, X_3, X_4) = 147.62$, $SS_{Res}(X_1, X_2, X_3, X_4) = 95.72$

(b) A model with an intercept and two regressors was built using 12 data-points. The observed, predicted and diagonal elements of the Hat matrix are given below. Compute 'Studentized Residuals', plot the normal probability plot and draw your conclusions:

Y_i	Y_i^	h_{ii}
11.5	10.22	0.071
14.88	9.57	0.085
18.11	20.71	0.043
17.83	18.37	0.068
21.5	21.90	0.196
21	24.72	0.114
19.75	21.20	0.078
29	35.67	0.166
19	16.85	0.096
35.1	33.46	0.102
52.32	38.42	0.392
19.83	28.74	0.121

3. The distribution of marks secured by students in a particular examination is believed to be a mixture of two normal variates with common variance 25 and equal mixing proportion. Fit the distribution for the following data corresponding to one such distribution.

Marks	Number of Students
<10	2
10-20	15
20-30	25
30-40	15
40-50	30
50-60	20
60-70	10
70-80	5
>80	2

(OR)

(a) Generate Five observations from $N_2\left(\begin{bmatrix}5\\2\end{bmatrix},\begin{bmatrix}10 & -5\\-5 & 8\end{bmatrix}\right)$

(b) Generate a sample of size 5 from Cauchy distribution with scale parameter 1 and location Parameter 3

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