Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College of Arts, Science and Commerce(Autonomous)

Programme: MSc. (Statistics) **Part-1** **Semester-2**

Practical based on Multivariate Analysis & its application
Principal Component Analysis

1) The sample correlation matrix is as follows:

$$R = \begin{matrix} 1 & 0.676 & 0.875 \\ - & 1 & 0.699 \\ - & - & 1 \end{matrix}$$

(Obtain 1st & 2nd practical components and find the proportion of variation explained by them. Find correlations of Y_1, Y_2 with original variables X_1, X_2, X_3.)

2) Find the principal components & the proportion of the total population variance explained by each when the covariance matrix is -

$$Sigma = \begin{matrix} 1 & 0.25 & 0.25 \\ 0.25 & 1 & 0.25 \\ 0.25 & 0.25 & 1 \end{matrix}$$

Find correlations of Y_1, Y_2 with original variables X_1, X_2, X_3.

3) Consider the correlation matrix :

$$R = \begin{matrix} 1 & 0.920 & 0.875 & 0.625 \\ 0.920 & 1 & 0.889 & 0.750 \\ 0.875 & 0.889 & 1 & 0.425 \\ 0.625 & 0.750 & 0.425 & 1 \end{matrix}$$

Find all four principal components, their variance & proportion of total variance.

4) Table shows six measurements on each of 25 pottery goblets excavated from prehistoric sites in Thailand illustrating the typical shape and the nature of the measurements. The main question of interest for these data concerns similarities and differences between the goblets, with obvious questions being. Carry out the principal component analysis.

Goblet	X_1	X_2	X_3	X_4	X_5	X_6
1	13	21	23	14	7	8
2	14	14	24	19	5	9
3	19	23	24	20	6	12
4	17	18	16	16	11	8
5	19	20	16	16	10	7
6	12	20	24	17	6	9
7	12	19	22	16	6	10
8	12	22	25	15	7	7
9	11	15	17	11	6	5
10	11	13	14	11	7	4
11	12	20	25	18	5	12
12	13	21	23	15	9	8
13	12	15	19	12	5	6
14	13	22	26	17	7	10
15	14	22	26	15	7	9
16	14	19	20	17	5	10
17	15	16	15	15	9	7
18	19	21	20	16	9	10
19	12	20	26	16	7	10
20	17	20	27	18	6	14
21	13	20	27	17	6	9
22	9	9	10	7	4	3
23	8	8	7	5	2	2
24	9	9	8	4	2	2
25	12	19	27	18	5	12

i) Find the correlation matrix and principal components.
ii) Also find principal component scores.

5) Case Study
