

B.E/B.Tech(Full Time) Degree End Semester(Arrear) Examinations April/ May 2012**Industrial Engineering Branch
VII Semester****IE 515 Multivariate Analysis
(Regulations 2004)****26****Time : 3 hours****Max Marks: 100**

Use of Industrial Engineering Tables May Be Permitted

Answer All Questions**Part – A (10 x 2= 20 Marks)**

1. What is regression analysis?
2. Define direct and inverse relationships.
3. What are the steps involved in detecting the outliers?
4. What do you mean by Eigen value? Give its application.
5. What are the requirements to be satisfied to choose the weights for principal components?
6. Define communality
7. Give application of discriminant analysis
8. What is discriminant ratio? How will you interpret it?
9. What is cluster analysis?
10. Give some hierarchical clustering techniques?

Part- B(5 x 16 = 80 marks)

11. The annual advertising expenditures (in lakhs of rupees) and the corresponding annual sales (in crores of rupees) for the past ten years of the company are presented in Table 1. Find the correlation coefficient between annual advertising expenditure and annual sales revenue using the basic formula as well as Pearson's product moment formula. Also test the significance of correlation coefficient at significance level of 0.05.

Table 1. Data on Annual Advertising Expenditure and Annual Sales

Year	Annual Expenditure	Annual Sales	Year	Annual Expenditure	Annual Sales
1	10	20	6	20	78
2	12	30	7	22	89
3	14	37	8	24	100
4	16	50	9	26	120
5	18	56	10	28	110

12. (a). The annual sales revenue (in crores of rupees) of the product as function of sales force (number of salesman) and annual advertising expenditure (in lakhs of rupees) for the past 10 years are summarized in Table 2. Design a regression model to forecast the annual sales revenue of the product.

Table 2: Details of Annual Sales Revenue, Sales Force and Annual Expenditure

Sl.No	Sales Revenue	Sales Force	Annual Expenditure
1	20	8	28
2	23	13	23
3	25	8	38
4	27	18	16
5	21	23	20

Sl.No	Sales Revenue	Sales Force	Annual Expenditure
6	29	16	28
7	22	10	23
8	24	12	30
9	27	14	26
10	35	20	32

(Or)

12. (b). Explain in detail the properties of Multivariate normal density

13. (a). The marketing manager of a two-wheeler company designed a questionnaire to study the customers feedback about its two-wheeler and in turn he is keen in identifying the factors of his study. He identified six variables which are listed below. Fuel Efficiency(X1), Life(X2), Handling(X3), Quality(X3), Breakdown Rate(X5), Price(X6). So the company administered a questionnaire among 10 customers to obtain their opinion on the above variables. The range of the scores for each of the above variables is assumed between 0 and 10. The score 0 means low rating and 10 means high rating. The survey data is summarized in Table 3. Perform factor analysis using centroid method to identify three factors which can represent the variables of the study. Correlation coefficient matrix is given in Table 4.

Table 3: Survey Data

Respondent	Variable					
	X1	X2	X3	X4	X5	X6
1	6	8	9	9	1	2
2	4	4	6	8	2	1
3	4	1	6	5	1	2
4	1	2	6	3	2	3
5	4	3	5	5	2	3
6	4	4	6	8	2	3
7	3	3	0	9	1	3
8	7	7	6	9	9	2
9	5	3	1	8	1	2
10	5	4	2	3	1	0

Table 4: Correlation coefficient

	X1	X2	X3	X4	X5	X6
X1	1	0.742	0.168	0.496	0.484	-0.430
X2		1	0.424	0.568	0.474	-0.204
X3			1	0.050	0.238	0.092
X4				1	0.290	0.196
X5					1	0.037
X6						1

(Or)

13. (b). Explain in details the steps involved in Principal Component Method.

14. (a). The director of a management school wants to do discriminant analysis concerning the effect of the two factors, namely, the yearly spending (in lakhs of rupees) on infrastructures of the school (X1) and yearly spending on interface events of the school (X2) on the grading of the school by inspection team. He has collected the data for the past 12 years and submitted to the inspection team as shown in table 5. Based on the data the committee has awarded one of the following grades as shown in the table. Determine the discriminant function.

Table 5. Yearly Spending on Infrastructure (X1) and Interface Events(X2)

Year	Grade	Infrastructure (X1)	Interface Events(X2)
1	Below	3	4
2	Below	4	5
3	Above	10	7
4	Below	5	4
5	Below	6	6
6	Above	11	4
7	Below	7	4
8	Above	12	5
9	Below	8	7
10	Below	9	5
11	Above	13	6
12	Above	14	8

(Or)

14. (b). Explain in detail the steps involved in Two-Group Discriminant analysis

15. (a). Explain any two clustering techniques in detail.

(Or)

15. (b). In a survey the number of years of experience of Employees in two different skills are summarized in the table 6.

Table 6: survey data about the number of years of experience on skills

Employee	Skill X	Skill Y
1	2	8
2	8	15
3	3	6
4	6	9
5	8	7
6	10	10

Cluster the employees using agglomerative hierarchical clustering Method. Also draw the Dendrogram.