

Indian Statistical Institute, Bangalore
MS (QMS) First Year, Second Semester
Multivariate Data Analysis

Mid-term Examination

Date: Feb 27, 2018

Maximum Marks:50

Time: 2 hours

Answer as many questions you can. Maximum you can score is only 50 marks

1.

- a. Explain four commonly used statistics in MANOVA
- b. The surface hardness, case depth and dimensional variation are three important performance characteristics of induction hardening process. The target values of surface hardness, case depth and dimensional variation are given by $\mu_0 = (500, 0.65, 0.18)$. A sample of 27 data points on surface hardness, case depth and dimensional variation are collected from the process. The mean vector \bar{x} and the inverse of corrected sample variance-covariance matrix S_u^{-1} are given below. Test whether on an average the process is on the target (F table value = 3.00).

$$\bar{x} = (489, 0.59, 0.23)$$

$$S_u^{-1} = \begin{pmatrix} 0.0007 & 0.0311 & 0.0697 \\ 0.0311 & 21.576 & -0.1535 \\ 0.0697 & -0.1535 & 57.7929 \end{pmatrix}$$

[13]

2.

- a. Explain the computational methodologies of factor analysis and principal component analysis?
- b. Briefly explain the differences between principal component analysis and factor analysis?

[12]

3.

- a. What is the objective of carrying out the rotation in factor analysis? Briefly explain the different methods of rotation?
- b. Give three different ways to identify the optimum number of factors?
- c. The correlation matrix of 3 variables from a code review process is given below. Carry out factor analysis, identify the variances and shortlist the optimum number of factors using different methods? Draw the scree plot?

	Coverage	Review Type	Domain Skill
Coverage	1.00	-0.84	-0.81
Review Type	-0.84	1.00	0.78
Domain Skill	-0.81	0.78	1.00

[15]

4. An online retailer wants to enhance the laptop business. The company has conducted a conjoint analysis to obtain the customer preferences. The details of the conjoint analysis with the aggregate ranking are given below. Analyze the data, compute part worth utilities and importance scores. What suggestions can you provide to the retailer to optimize the laptop business?

Combinations	Brand	Weight (kg)	Hard drive Capacity	Clock Speed	Score
1	Acer	1.8	1 TB	3.8	1.2
2	Acer	1.3	360 GB	3.5	1.5
3	Acer	1.1	256 GB	2.5	1.7
4	Dell	1.8	360 GB	2.5	1.3
5	Dell	1.3	256 GB	3.8	4.4
6	Dell	1.1	1 TB	3.5	6.9
7	HP	1.8	256 GB	3.5	4.3
8	HP	1.3	1 TB	2.5	6.8
9	HP	1.1	360 GB	3.8	9.5

[15]