UNIVERSITY OF THE PUNJAB

Roll No. in Fig. ....

B.S. 4 Years Program / Eighth Semester – 2019

Roll No. in Words. ....

Paper: Multivariate Analysis

Course Code: STAT-414 Part – I (Compulsory) Time: 15 Min. Marks: 10

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option. (10x1=10)

i. Which of the following statistical techniques is appropriate when the variables to be analyzed are interrelated without designations as to whether they are criterion and predictor variables?

a) Multiple regression b) Multivariate analysis of variance
c) Discriminant analysis d) Factor analysis
e) Path analysis

ii. Which of the following statistical techniques identifies patterns underlying combinations of the original variables capable of summarizing the original set?

a) Factor analysis b) Multivariate analysis of variance
c) Cluster analysis d) Multidimensional scaling
e) Discriminant analysis

iii. Hotelling's T^2 statistics has the following distribution.

a) Chi-square b) Normal
c) F d) Binomial
e) t-distribution

iv. The number of correctly classified cases in discriminant analysis is given by the:

a) F statistics b) Cutting Score
c) Degrees of freedom d) Hit rate
e) None of the above

v. A multivariate generalization of student's t-distribution is:

a) Hotelling T^2 b) MANOVA
c) PCA d) None of these

vi. Discriminant analysis can be used to answer questions such as:

a) How much of a variation in sales can be explained by advertising expenditures, prices, and level of distribution?
b) In terms of demographic characteristics, how do customers who exhibit store loyalty differ from those who do not?
c) What are the distinguishing characteristics of consumers who respond to direct main solicitation?
d) Both B and C are correct

P.T.O.

vii. What does it means if the discriminant function is estimated and the square of the canonical correlation is 0.64%.

a) 64% of the variance in the dependent variable is explained by the model.
b) The null hypothesis is not rejected. Therefore, there is no significant discrimination between groups.
c) 64% of the explained variance is accounted for.
d) Both B and C are correct

viii. A technique for the study of interrelationships among variable, usually for the purposes of data reduction and the discovery of underlying constructs or latent dimensions is known as:

a) Multiple Regression
b) Discriminant analysis
c) Factor analysis
d) Canonical analysis

ix. To determine which variables related to which factors, a researcher would use:

a) Factor Loadings
b) Communalities
c) Eigen values
d) None of these

x. Which of the following can be used to determine how many factors to take from a factor analysis.

a) Eigen values
b) Scree Plot
c) % of variance
d) All of these

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Paper: Multivariate Analysis
Course Code: STAT-414 Part – II

Time: 2 Hrs. 45 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

SHORT QUESTIONS

Q2. Define the following: (5 marks each)

i) Common Factors and Specific Factors
ii) Fisher's Discrimination Rule
iii) Canonical Correlations Analysis
iv) Principal Component Analysis for Standardized Variables

SUBJECTIVE

Q3. Derive the distribution of Hotelling T^2-statistic for testing $H_0 : \mu = \mu_0$. (10)

Q4. Discuss the principal components from equal correlation matrix $\rho = \begin{bmatrix} 1 & 0.6 & 0.6 \\ & 1 & 0.6 \\ & & 1 \end{bmatrix}$ (06)

Q5. Suppose that X is a multinomial random variable which comes either from P_1 with multinomial probabilities $\alpha_1, \alpha_2, \ldots, \alpha_k$ or from P_2 with multinomial probabilities $\beta_1, \beta_2, \ldots, \beta_k$ where $\sum_{i=1}^{k} \alpha_i = \sum_{i=1}^{k} \beta_i = 1$ and $\sum_{i=1}^{k} x_i = n$. Discuss the maximum likelihood discriminant rule. *(06)*

Q6. The covariance matrix for four standardized variables Z_1, Z_2, Z_3, Z_4 is,

$$\rho = \begin{bmatrix} 1 & 0.4 & 0.5 & 0.6 \\ & 1 & 0.3 & 0.4 \\ & & 1 & 0.2 \\ & & & 1 \end{bmatrix}$$

Let $\mathbf{Z}'_1 = [Z_1 \quad Z_2]$ and $\mathbf{Z}'_2 = [Z_3 \quad Z_4]$. Find canonical correlation between $\mathbf{Z}'_1$ & $\mathbf{Z}'_2$. Also find the first pair of canonical variates. *(08)*