

AQ - 1012

**Third Semester M. A. / M. Sc. (Part-II)
(CBCS Pattern) Examination**

STATISTICS

**Paper - X (3 SCA - 2)
(Multivariate Analysis)**

P. Pages : 3

Time : Three Hours]

[Max. Marks : 80

Note : Solve either A or B in each question.

1. (A) (a) Obtain the probability function and characteristic function of multinormal distribution.
- (b) If X (with P components) is distributed according to $N(\mu, \Sigma)$. Show that $Y = CX$, where C is a non-singular matrix, is distributed according to $N(c\mu, c\Sigma c')$. (8 + 8)

OR

- (B) (i) Define negative multinomial distribution. Obtain its p. m. f.
- (ii) Obtain distribution of sample mean vector in case of multivariate normal distribution. (8 + 8)

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2. (A) (a) Explain the use of sample generalized variance in case of testing.
 (b) Show that Wishart distribution is a multi-variate generalization of chi-square distribution. (8 + 8)

OR

- (B) (i) State and prove any two properties of Wishart distribution.
 (ii) Show that m. g. f. of Wishart distribution is $(1 - k \sum)^{-n/2}$, where symbols have their usual meaning. (8 + 8)
3. (A) (a) Define Hotelling's T^2 statistic. How Hotelling's T^2 distribution is related to t-distribution ?
 (b) What is Mahalanobis D^2 statistic ? Discuss any one use of it. [8 + 8]

OR

- (B) (i) Define Mahalanobis distance between two p-variate normal populations $N_p(\mu_1, \Sigma)$ and $N_p(\mu_2, \Sigma)$. State its relationship with Hotelling's T^2 .
 (ii) Derive null distribution of Hotelling's T^2 . (6 + 10)

4. (A) (a) Define Anderson's classification statistic. Explain its role in discriminatory analysis.
 (b) State and explain any two tests associated with discriminant functions. [8 + 8]

OR

- (B) (i) Define discriminant function. Explain the procedure of allocation of an observation to one of the two groups using Fisher's discriminant function.
 (ii) What is meant by misclassification ? Describe different kinds of misclassifications. How will you estimate probabilities of misclassification ? [8 + 8]

5. (A) Define canonical correlation and canonical variables. Explain the method of obtaining population canonical variables.

OR

- (B) Define principal components. Describe the procedure of obtaining principal components. How is it a data reduction technique ? 16