# M. Sc. (Sem. II) (CBCS) Examination

April / May - 2018

## MS - 203 : Applied Multivariate Analysis

### Faculty Code : 003
### Subject Code : 1172003

Time : $2\frac{1}{2}$ Hours] 　　　　　　　　[Total Marks : **70**

**Instructions :** (1) Attempt all questions.

　　　　　　　 (2) Each question carries equal marks.

**1** Answer any **seven** of the following : 　　　　　　　　**14**

(1) Test based on _____ is Unbiased, UPM and Admissible.

(2) Wishart distribution is a multivariate analog to _____ distribution.

(3) _____ statistic is a generalization of Student's t–statistic

(4) _____ test has a monotonic power function.

(5) Exp $\left( it'\mu - \frac{1}{2}t'\Sigma t \right)$ is a characteristic function of _____ distribution.

(6) If $X_1, X_2.....X_N$ be a random sample of size N from $N_p(\mu, \Sigma)$ then $\bar{X} \sim$ _____

(7) If $X \sim W_P(n, \Sigma)$ then $Y = CX \sim$ _____, where C is scalar.

(8) In expression of _____ the term $\left( \bar{X}^{(1)} - \bar{X}^{(2)} \right)' S^{-1} \left( \bar{X}^{(1)} - \bar{X}^{(2)} \right)$ is known as Mahalanobis $D^2$.

(9) The concept of distance between two multivariate normal populations was proposed in _____.

(10) Principal component analysis is _____ reduction technique.

2 Answer the following questions : (Any **Two**) 14

    (a) If $X \sim N_p(\mu, \varepsilon)$ then show that $Y \sim N_p(\mu, c\varepsilon c')$, where $Y = CX$ and C is non-singular matrix.

    (b) Explain the reproductive property of Wishart's distribution.

    (c) Explain principal components.

3 Answer the following questions : 14

    (a) Obtain conditional distribution of multivariate normal distribution.

    (b) Obtain probability density function of multivariate normal distribution.

**OR**

3 Answer the following questions : 14

    (a) If a p–component vector $Y \sim N_p(0, T)$ then show that $Y'T^{-1}Y$ is distributed as $\chi_p^2$ where T is non–singular matrix.

    (b) State and prove any two applications of Hotelling's $T^2$.

4 Answer the following questions : (Any **Two**) 14

    (a) State and prove Invariant property of Hotelling's $T^2$.

    (b) State and prove the necessary and sufficient condition for Multivariate Normal distribution.

    (c) Obtain the probability density function of Wishart's distribution.

5 Answer the following questions : (Any **Two**) 14

    (a) Obtain characteristic function of Wishart's distribution.

    (b) Explain Mahalanobis $- D^2$.

    (c) Derive the distribution of Hotelling's $T^2$.

    (d) Find characteristic function of multivariate normal distribution.