MSc DEGREE EXAMINATION MAY 2026

(Second Semester)

Branch - **STATISTICS**

DISTRIBUTION THEORY

Time: Three Hours | Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	If X and Y are independent normal variables, the distribution of X− Y is a) Normal b) t c) χ^2 d) Poisson	K1	CO1
	2	If $Y=X^2$and X has pdf f(x), the pdf of Y is obtained using a) Transformation method b) Convolution theorem c) Bayes rule d) Taylor expansion	K2	CO1
2	3	For a sample of size 'n', the largest order statistic is a) $X_{(1)}$ b) $X_{(n)}$ c) $X_{(n-1)}$ d) Mean	K1	CO2
	4	When the t-distribution becomes normal a) $n \rightarrow 1$ b) $n \rightarrow \infty$ c) $n = 2$ d) variance = 0	K2	CO2
3	5	A p-dimensional normal distribution is characterized by a) p means b) covariance matrix c) mean vector and covariance matrix d) variance	K1	CO3
	6	The covariance matrix of MVN distribution is a) symmetric b) skew symmetric c) diagonal always d) triangular	K2	CO3
4	7	Wishart distribution is defined for a) scalar variables b) matrices c) vectors only d) constants	K1	CO4
	8	Recall the usage of Hotelling T^2 statistic its test _____ a) mean vector b) variance c) correlation d) regression	K2	CO4
5	9	State the use of Discriminant analysis a) classification of observations b) regression c) clustering d) sampling	K1	CO5
	10	Principal Component Analysis converts correlated variables into _____ a) dependent variables b) orthogonal components c) identical variables d) random variables	K2	CO5

Cont...

Module No.	Question No.	Question	K Level	CO
1	11.a.	Delineate about distribution function. State its properties.	K3	CO1
		(OR)		
	11.b.	Explain the distribution of the product of two random variables.		
2	12.a.	Derive the pdf of r^{th} Order statistics.	K4	CO2
		(OR)		
	12.b.	Describe t distribution with its assumptions and conditions. Illustrate any one application.		
3	13.a.	Obtain the characteristic function of multivariate normal distribution.	K5	CO3
		(OR)		
	13.b.	Bring out the distribution of Quadrate functions in normal variables.		
4	14.a.	Define Wishart distribution. State any two properties of Wishart distribution.	K4	CO4
		(OR)		
	14.b.	Briefly explain the concept of Mahalanobis D^2 distribution.		
5	15.a.	What is canonical correlations? Mention the purpose of canonical correlation analysis.	K4	CO5
		(OR)		
	15.b.	Write a note on Discriminant Analysis & Cluster Analysis.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks $(3 \times 10 = 30)$

Module No.	Question No.	Question	K Level	CO
1	16	Derive the probability mass function of Binomial distribution truncated at $x = 0$. Obtain its mean and variance.	K3	CO1
2	17	Derive non – central Chi-square distribution.	K4	CO2
3	18	Estimate the mean vector and the covariance matrix of a multivariate normal distribution.	K5	CO3
4	19	Bring out the test procedure for Mahalanobis D^2 statistic and its comparison with T^2. State the significance of Mahalanobis D^2.	K5	CO4
5	20	Let X be a p – variate random variable with covariance matrix Σ. Derive the first principal component of X.	K5	CO5

Z-Z-Z END