PB **5722**

Roll No. _____ Total No. of Pages: 02

M.A./M.Sc. (Semester-IV) Examination - June- 2026
Mathematics
Paper - Math 403
Mathematical Statistics-II

Time Allowed: Three Hours **Maximum Marks: 100**

This question paper contains two sections as under :

Section-A **Max. Marks-20**

This section will have 10 questions, having 02 questions from each unit. Answer in about 20 words. All questions will have equal marks. (2×10=20)

Section-B **Max. Marks-80**

This section will have 10 questions, having 02 questions from each unit, one question to be attempted from each unit. Words limit approximately 400-500 words. Questions may have sub divisions. All questions will have equal marks. (16×05=80)

Section-A

1. (i) Write formula for students t distribution name the symbol used in it.
   (ii) Explain order statistics.
   (iii) Write one property of maximum likelihood estimator.
   (iv) What estimates minimum chi-square method?
   (v) What is unbiased estimator?
   (vi) What is confidence interval?
   (vii) Explain partial correlation.
   (viii) Regression coefficients.
   (ix) What is normal approximation?
   (x) Sign test.

Section-B

Unit-I

2. Show that when $n \to \infty$, t distribution approaches to normal distribution.

OR

Show that the r^{th} moment of F distribution about origin is

$$\left(\frac{\nu_1}{\nu_2}\right)^r \frac{1}{B\left(\frac{\nu_1}{2}, \frac{\nu_2}{2}\right)} B\left(r+\frac{\nu}{2}, \frac{\nu}{2}-r\right), \nu_2 > 2r$$

Unit- II

3. (a) Find the maximum likelihood estimator for the parameter λ of a Poisson distribution on the basis of a sample of size n. Also find its variance.

   (b) Show that the sample mean $\overline{X}$ is sufficient for estimating the parameter λ of the Poisson distribution.

$$P(X=x)=\frac{e^{-\lambda}\lambda^{x}}{(x)!} \quad x=1,2,3,4,.....$$

OR

Estimate α and β in the case of Pearson's Type III distribution.

$$\frac{\beta^{a}}{\sqrt{(a)}}x^{a-1}e^{-\beta x},\ 0\le x<\infty$$

by the method of moments.

Unit – III

4. State the prove Crammer-Rao inequality.

OR

In two large populations. There are 30 and 25 per cent respectively of blue-eyed people is this difference likely to be significant in samples of 1200 and 900 respectively from the two populations. Given that the value of z at 95% is 1.96.

https://www.uokonline.com

Unit – IV

5. Find the regression equation of X_1 on X_2 and X_3 given the following results

Trail

Standard deviation

Variate	Mean	Standard deviation	r_{12}	r_{23}	r_{31}
X_1	28.02	4.42	.80	--	--
X_2	4.91	1.10	--	-.56	--
X_3	594	85	--	--	-.40

OR

In a trivariate distribution

$\sigma_1=2,\ \sigma_2=\sigma_3=3,\ r_{12}=.7,\ r_{23}=r_{31}=.5$

find (1) $r_{23\,1}$, (2) $R\ 1.23$ (C) b_{123}

Unit- V

6. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans. The numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory. Given that
The value of chi-square at 0.05 level of significance with d.f. 6 is 12.59 and
The value of chi-square at .95 level or significance with d.f. is 1.632

OR

Explain in detail

(1) Median test

(2) Test of independence.