

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

M.Sc.Applicable Mathematics - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - II

24PAMET2A02 - Mathematical Statistics

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. State and prove Rao-Blackwell theorem.
2. In sampling from $\bar{X} \sim N(\mu, \sigma^2)$, Obtain the shortest length of $100(1 - \alpha)\%$ of confidence interval for σ^2 .
3. State and prove Cramer-Rao inequality.
4. Briefly explain Most Powerful tests procedure.
5. Find the power of a best critical region for testing a simple hypothesis against a simple alternative is never less than its size.
6. Let $x_1, x_2, \dots, x_n \sim N(\mu, \sigma^2)$ for testing $H : \sigma^2 = \sigma_0^2$ and $K : \sigma^2 \neq \sigma_0^2$. Obtain the best test procedure of level σ .
7. Test the significance of
 $H_0 : IQ \text{ sample mean} = 100$
 $H_1 : IQ \text{ sample mean} > 100$
 Obtain the sample mean is equal to 100
8. Compare the various sum of squares in one-way ANOVA.

Section C

I - Answer any **TWO** questions ($2 \times 10 = 20$ Marks)

9. Let x_1, x_2, \dots, x_n be a random sample from a normal distribution $N(\mu, \sigma^2)$. Estimate μ and σ by the method of moments.
10. State and prove Neyman-Pearson fundamental lemma.
11. Let $x_1, x_2, \dots, x_n \sim N(\mu, \sigma^2)$, for testing $H : \mu = \mu_0$ and $K : \mu = \mu_1$, obtain the Likelihood Ratio Test (*LRT*) for μ is known.
12. Elaborate Lehmann-Scheffe theorem.

II - Compulsory question ($1 \times 10 = 10$ Marks)

13. Derive the two-way ANOVA with one observation per cell.
