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.
B.Sc.Mathematics - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - IV

20UMAAT4004 - Mathematical Statistics - II

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

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

1. Derive the probability density function of chi-square distribution with n degrees of freedom.
2. Prove that $\mu'_r = \dfrac{2^r\Gamma(n/2) + r}{\Gamma(n/2)}$ by using chi-square distribution.
3. Formulate the proof of Rao-Blackwell theorem after stating it.
4. Define estimator and explain briefly some of the criteria that should satisfied by a good estimator.
5. Write the properties of maximum likelihood estimators.
6. Show that if a sufficient estimator exists, then it is a function of the maximum likelihood estimator.
7. What is a statistical hypothesis? Define
   (i) two types of errors
   (ii) power of a test with reference to testing of a hypothesis.
8. Write a short note on the chi square test of goodness of fit of a random sample to a hypothetical distribution.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Define fisher's t - distribution and derive the probability density function of fisher's t - distribution.
10. State and prove Cramer's Rao inequality.
11. Explain the methods of estimation:
    (i) Method of moments and
    (ii) Maximum likelihood. Do these lead to
    the same estimates in respect of the standard deviation of a normal distribution?

Contd...

12. (i) What are simple and composite statistical hypotheses? Give examples.
    (ii) Define Null and alternative hypotheses.

13. For 2 x 2 table, $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ prove that chi square test of independence as:

$$\chi^2 = \frac{N(ad-bc)^2}{(a+c)(b+d)(c+d)},\ N = a+b+c+d.$$

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