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. Explain how the sum of n-independent chi-square variates is also a chi-square variate.
2. A random sample (X_1,X_2,X_3,X_4,X_5) of sixe 5 is drawn from a normal population with unknown mean μ. Consider the following estimators to estimate μ.

   (i) t_1=$\dfrac{X_1 + X_2 + X_3 + X_4 + X_5}{5}$

   (ii) t_2=$\dfrac{X_1 + X_2}{2} + X_3$,

   (iii) $t_3 = \dfrac{2X_1 + X_2 + \lambda X_3}{3}$

   where λ is such that t_3 is unbiased estimator of μ. Find λ. Are t_1 and t_2 unbiased estimators?
3. Obtain the minimum variance unbiased estimator for the mean of a normal population where variance is known.
4. Calculate the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample of size n.
5. What are the two types of errors that can occur while testing a hypothesis? How is it related to the size of critical region and power of the test?
6. In a sample of 1000 people in Maharashtra, 540 are rice eaters and rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?
7. Random sample of 10 boys have the following IQ 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Does the data support the assumption of a population mean IQ of 100?
8. Out of 8000 graduates in a town 800 of females, out of 1600 graduate employees 120 of females. Use Chi Square test to determine if any distinction is made in appointment on the basis of gender. The value of Chi Square at 5% level for 1 degree of freedom is 3.84.

Contd...

Section C

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

9. Derive the density function of the Chi Square variate.
10. State and prove Cramer Rao inequality.
11. Find the 95% confidence limits for the mean of a normal population.
12. Let p be the probability that a coin will fall head in a single toss in order to test H_0: p=1/2 against H_1: p=3/4. The coin is tossed five times and H_0 is rejected if more than three heads are obtained. Find the probability of type I and type II error and power of the test.
13. A sample analysis of examination results of 200 MBA's was made. It was found that 46 students had failed, 68 secured a third division, 62 secured second division and arrests were released in first division. Can we conclude that the general examination result is in the ratio 4 : 3 : 2 : 1 for various categories respectively.

*****