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. Appl Maths - END SEMESTER EXAMINATIONS APRIL - 2024
SEMESTER - II
20PAMET2002 - Mathematical Statistics

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

Section B

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

1. If Tn is a sequence of estimators such that ETn $\to \psi(\theta)$ and var(Tn) $\to$ 0 as n $\to \infty$, then prove that Tn is consistent for $\psi(\theta)$.
2. Let X $\sim$ b(1, θ^2). Does there exist an unbiased estimator of θ?
3. Find confidence interval for mean of normal population when the variance is known.
4. Let X_1, X_2,... , X_n be a sample from $N(\mu, \sigma^2)$. Find the method of Moments estimator for the parameters (μ, σ^2).
5. Let X be an RV with PMF under H0 and H1 given by

x	1	2	3	4	5	6
f_o(x)	0.01	0.01	0.01	0.01	0.01	0.95
f_1(x)	0.05	0.04	0.03	0.02	0.01	0.85

   Find λ(x)
6. The standard deviation of capacity for batteries of a standard type is known to be 1.66 ampere-hours. The following capacities (ampere-hours) were recorded for 10 batteries of anew type: 146, 141, 135, 142, 140, 143, 138,137, 142, 136. Does the new battery differ from the standard type with respect to variability of capacity?
7. The mean life of a sample of 9 light bulbs was observed to be 1309 hours with a standard deviation of 420 hours. A second sample of 16 bulbs chosen from a different batch showed a mean life of 1205 hours with a standard deviation of 390 hours. Test whether there is a significant difference between the means of the two batches, assuming that the population variances are the same

Contd...

8. Describe the layout and the model for two way analysis of variance with one observation per cell.

Section C

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

9. Find the CRK bound for the variance of an unbiased estimator of θ in sampling from N(θ, 1)

10. A die is rolled 120 times with the following results:

Result :	1	2	3	4	5	6
Frequency:	20	0	20	25	15	10

Test the hypothesis that the die is fair at 95%

11. If a sufficient statistic T exists for the family $\{f_\theta = \in \Theta\}$, $\Theta = \{\theta_0, \theta_1\}$, then prove that Neyman-Pearson MP test is a function of T.

12. A manufacturer claims that the lifetime of a certain brand of batteries produced by his factory has a variance of 5000 (hours)^2 . A sample of size 26 has a variance of 7200 (hours)^2 . Assuming that it is reasonable to treat these data as a random sample from a normal population, test the manufacturer's claim at the 98% level of significance.

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

13. The following are the coded values of the amounts of corn (in bushels per acre) obtained from four varieties, using unequal number of plots for the different varieties:

A: 2, 1, 3, 2
B: 3, 4, 2, 3, 4, 2
C: 6, 4, 8
D: 7, 6, 7, 4

Test whether there is a significant difference between the yields of the varieties.

******