

Time : 3 Hours]

1 (a) What is point estimation and interval estimation? State the difference between them with illustrations.

(b) Explain maximum likelihood estimation. Obtain maximum likelihood estimators of μ and σ^2 in $N(\mu, \sigma^2)$ distribution based on a random sample of size n .

(a) Discuss method of moments. Obtain moment estimate of parameter θ of the distribution $f(x, \theta) = (a+1)x^a$, $0 < x < 1$, $a > 0$ based on a random sample of size n .

(b) State C.R. inequality. Discuss its interpretation. Obtain CRLB for the variance of unbiased estimate of λ in Poisson distribution with mean $\lambda > 0$ based on a random sample of size n .

2 (a) Discuss most powerful test. Let $X \sim N(0, 1)$. To test $H_0: \theta = 5.5$ versus $H_1: \theta = 8$ a random sample of size $n = 9$ is taken. Find Type-I error and power function of the test if the critical region is $\bar{X} > 6.0473$.

(b) What is SPRT? Explain with illustration. State the difference between SPRT and test obtained by NP lemma.

(a) Derive UMP test for testing $H: \theta \leq \theta_0$ versus $K: \theta > \theta_0$ from a random sample of size n taken from exponential distribution with mean $\theta > 0$.

(P.T.O)

(b) Derive SPRT to test $H: p = p_0$ versus $K: p = p_1, p_1 > p_0$ in case of binomial $b(n, p)$ distribution based on a given sequence of observations.

3 (a) Discuss fully one way analysis of variance.
 (b) What is factorial design? Discuss 2^2 factorial design with illustration.

(a) Analyse the following data to test $H: \mu_1 = \mu_2 = \mu_3$ at 5% level. OR

Group 1:	15	10	12	08	09	17
Group 2:	20	07	05	15		
Group 3:	10	13	14	06		

(b) Analyse the following design and test the appropriate hypotheses at 5% level.

Treatments	Blocks		
	B ₁	B ₂	B ₃
I	10	15	17
II	20	12	18
III	25	14	15

4 (a) What do you mean by non-parametric tests? State the difference between parametric and non-parametric tests.

(b) Using Kruskal-Wallis test, test whether the daily average profit of the three companies are same or not at 5% level.

Company I:	200	520	300	150	700	400
Company II:	600	250	780	630	520	490
Company III:	700	650	320	800	480	570

OR

(a) Discuss Wilcoxon sign-rank test.

(b) Using Kolmogorov-Smirnov test, test whether the following is a random sample taken from exponential distribution with mean $\theta = 2$ at α at 5% level.
 1.7, 5, 3.8, 2.7, 0.8, 1.3

5 Answer the following.

1. Standard error of $\bar{x}_1 - \bar{x}_2$, the difference of two independent sample means is

(a) $\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$

(b) $\sqrt{\frac{S_1^2}{n_1} - \frac{S_2^2}{n_2}}$

(c) $\sqrt{\frac{S_1^2}{n_2} - \frac{S_2^2}{n_1}}$

(d) $\sqrt{\frac{S_1^2 + S_2^2}{n_1 + n_2}}$

2. Rao-Blackwell theorem is used to obtain

(a) interval estimate of parameter θ (unknown).

(b) minimum value of the variance of any estimator.

(c) minimum variance unbiased estimator.

(d) good estimator.

3. The general formula to obtain 95% confidence interval using the statistic T is

(a) $T \pm 1.96 SE(T)$

(b) $T \pm 2.57 SE(T)$

(c) $T \pm 2 SE(T)$

(d) $T \pm 3 SE(T)$

4. Variance of sample proportion p is

(a) $\frac{pq}{n}$

(b) $\frac{pq}{n-1}$

(c) $\frac{n pq}{n-1}$

(d) $(n-1) pq$

5. Define critical region

6. Define TYPE I error.

7. Define power of the test.
 8. Define unbiased test.
 9. State full form of UMPU.
 10. State full form of CRD.
 11. State the formula to estimate one missing value in CRD.
 12. State the use of Sum test.
 13. State the use of Sign test.
 14. State the use of Median test.
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1.87-6

3 (a) $H: \mu_1 = \mu_2 = \mu_3$ 9 5% t -test F -test
 નિમ્ને લખેલ તારીખો t -test F -test

ગ્રુપ 1:	15	10	12	08	09	17
ગ્રુપ 2:	20	07	05	15		
ગ્રુપ 3:	10	13	14	06		

(b) નિમ્ને લખેલ રકમો t -test F -test નો સોલ્યુશન આપો
 5% t -test F -test

		B_1	B_2	B_3
ગ્રુપ	I	10	15	17
	II	20	12	18
	III	25	14	15

4 (a) અનુભવના પાયાઓ માટે t -test સમજાવો 9 ગ્રુપના
 અને અનુભવના પાયાઓ વચ્ચેનો તફાવત t -test

(b) ~~અનુભવ~~ - વૈકલ્પિક પરીચલન માટે આપેલ આંકો 5% t -test
 સરેરાશો સરેરાશો નો t -test આંકોનો સમાવેશ કરો

ગ્રુપ 1:	200	500	300	150	700	400
ગ્રુપ 2:	600	250	780	630	500	490
ગ્રુપ 3:	700	650	320	800	480	570

4 (a) વિશ્લેષણ સંજ્ઞા - અનુભવ પાયાઓ નો સમાવેશ
 (b) સરેરાશો સરેરાશો - આંકોના પાયાઓ નો સમાવેશ 5%
 t -test નિમ્ને લખેલ સુધારા કોષ્ટક $t = 2$
 નો આધાર પરિણામ આપેલ છે નહીં.
 1.7, 5, 3.8, 2.7, 0.8, 1.3

