

Time: 3 Hours

Max. Marks: 70

PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

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|-----|--|-----|----|----|
| 1 a | State Normal distribution and its mean | CO1 | L2 | 2M |
| b | State the invariance property of Consistent estimator | CO1 | L1 | 2M |
| c | Define method of moments. | CO2 | L1 | 2M |
| d | List the properties of maximum likelihood estimation. | CO2 | L1 | 2M |
| e | Find the lower, upper confidence limits and also confidence coefficient for $P[0 \leq \theta \leq 1.5] = 0.90$ | CO3 | L1 | 2M |
| f | Write the confidence interval for Population proportion when population variance is known and population variance is unknown | CO4 | L1 | 2M |
| g | Explain the errors in sampling. | CO5 | L1 | 2M |
| h | Define the contingency table. | CO5 | L1 | 2M |
| i | Define t-test for single mean. | CO6 | L1 | 2M |
| j | Write the formula for F-test. | CO6 | L1 | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

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|-----|---|-----|----|----|
| 2 a | Derive mean and variance of Binomial distribution. | CO1 | L3 | 5M |
| b | If X is a Poisson variate such that $3P(X = 4) = \frac{1}{2}P(X = 2) + P(X = 0)$, find (i) Mean (ii) $P(X \leq 2)$. | CO1 | L2 | 5M |

OR

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| 3 a | In a Normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution | CO1 | L4 | 10M |
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UNIT-II

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| 4 | In a watch repair shop, the service time in minutes is 14, 17, 27, 18, 12, 8, 22, 13, 19 and 12. Give a maximum likelihood estimate of mean service time with the assumption that the service time follows an exponential distribution with parameter λ . | CO2 | L2 | 10M |
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OR

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|---|---|-----|----|-----|
| 5 | The following data represents the body weight (Y)kg, body length (X_1)cm and body breadth (X_2)cm of 12 randomly selected sea fish. | CO2 | L2 | 10M |
|---|---|-----|----|-----|

X_1	12	20	14	25	18	16	10	18	18	20	16	12
X_2	4	7	6	12	10	8	4	8	9	10	7	4
Y	0.	0.	0.	2	1.	0.	0.	0.	1.	1.	0.	0.
	5	8	7	2	2	9	4	9	4	5	8	6

Assume the linear model of Y, X_1 and X_2 as $Y = a + bX_1 + cX_2$. Estimate the parameters a, b & c by the method of least squares**UNIT-III**

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| 6 a | Out of 300 households in a town 123 have T.V sets, find 95% confidence limits to the true value of proportion of households with T.V sets in the whole town. | CO3 | L3 | 5M |
| b | Out of 20000 customers ledger accounts a sample of 600 accounts was taken to test the accuracy of posting and balancing where in 45 mistakes were found. Assign limits within which the number of defective cases can | CO3 | L3 | 5M |

be expected at 5% level of significance.

OR

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| 7 | From the lots of transparent polyester film sheets produced by two machines samples are taken from both the machines and thickness values of the film sheets in millimicrons are measured. The results are given below | CO4 | L4 | 10M |
|---|--|-----|----|-----|

Machine	Sample size	Mean	Sample variance
1	10	115	25
2	12	112	9

- (i) Compute 95% confidence intervals for the difference of population means assuming that the unknown population variances are equal.
(ii) Compute 99% confidence intervals for the difference of population means assuming that the unknown population variances are not equal.

UNIT-IV

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|---|--|-----|----|-----|
| 8 | Suppose x_1, x_2, \dots, x_n is a random sample from a normal distribution with mean μ and variance 16. Find the best critical region with a sample size of $n=16$ and a significance level $\alpha = 0.05$ to test the simple null hypothesis $H_0: \mu=10$ against a simple alternative hypothesis $H_1: \mu=15$. | CO5 | L3 | 10M |
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OR

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|---|---|-----|----|-----|
| 9 | Let x_1, x_2, \dots, x_n be a random sample of n observations from $N(\mu, \sigma^2)$ we need to test the null hypothesis $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 \neq \sigma_0^2$ by the method of likelihood ratio test | CO5 | L4 | 10M |
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UNIT-V

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|----|--|-----|----|-----|
| 10 | Samples of two types of electrical light bulbs were tested for length of life and following data were obtained | CO6 | L2 | 10M |
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	Type I	Type II
Sample numbers	8	7
Sample mean	1234 hrs	1036 hrs
Sample S.D	36 hrs	40 hrs

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life

OR

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|----|---|-----|----|-----|
| 11 | The following table gives the classification of 100 workers according to gender and nature of work. Test whether the nature of work is independent of the gender of the worker ($\chi^2 = 3.84$ at 1d.f) | CO6 | L4 | 10M |
|----|---|-----|----|-----|

	Stable	Unstable	Total
Males	40	20	60
Females	10	30	40
Total	50	50	100

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