



**2022/TDC/ODD/SEM/
STSDSC/GE-301T/115**

TDC (CBCS) Odd Semester Exam., 2022

STATISTICS

(3rd Semester)

Course No. : STSDSC/GE-301T

(Statistical Inference)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Define any *three* of the following : 1×3=3

- (a) Parameter
- (b) Random sample
- (c) Level of significance
- (d) Statistic



(2)

2. Answer any *one* of the following : 2
- (a) Distinguish between null hypothesis and alternative hypothesis.
 - (b) What do you mean by power of a test and critical region?
3. Answer any *one* of the following : 5
- (a) What are simple and composite hypotheses? Give examples.
 - (b) Explain the concepts of type-I and type-II errors.

UNIT—II

4. Answer any *three* of the following : $1 \times 3 = 3$
- (a) What is sampling distribution of a statistic?
 - (b) Define standard error.
 - (c) What is the significant value of z at 5% level of significance for a two-tailed test?
 - (d) What is the test statistic for testing the significance for difference of proportions in large sample?

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(3)

5. Answer any *one* of the following : 2
- (a) Obtain the standard error of sample mean of a random sample of size n .
 - (b) Explain the test of significance for testing the single mean in large samples.
6. Answer any *one* of the following : 5
- (a) Explain the test of significance for testing the difference of means in large samples.
 - (b) A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Show that the SE of the proportion of bad ones in a sample of this size is 0.015 and deduce that the percentage of bad pineapples in the consignment almost certainly lies between 8.5 and 17.5.

UNIT—III

7. Answer any *three* of the following : $1 \times 3 = 3$
- (a) Define chi-squared variate.
 - (b) What is F -statistic?
 - (c) Write the p.d.f. of t -distribution.
 - (d) What is the limit of chi-squared variate?

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(Turn Over)



(4)

8. Answer any one of the following : 2

- (a) Write the applications of F-distribution.
- (b) State the conditions for the validity of chi-squared test.

9. Answer any one of the following : 5

- (a) What is a contingency table? The following data is collected on two characters :

	Cinegoers	Non-Cinegoers
Literate	83	57
Illiterate	45	68

Based on this, can you conclude that there is no relation between the habit of cinema going and literacy?

[Table value of $\chi^2_{0.05}$ for 1 d.f. = 3.841]

3+2=5

- (b) Define Student's t-statistic. A random sample of 10 observations gave the following results :

$$\sum_{i=1}^{10} x_i = 400, \quad \sum_{i=1}^{10} x_i^2 = 16150$$

Test if the sample has come from a population with mean 35.

[Given table value of t at 5% level of significance for 8 d.f. is 2.31 and for 9 d.f. is 2.26]

2+3=5

(5)

UNIT—IV

10. Answer any three of the following : 1×3=3

- (a) What is a parameter space?
- (b) What is the consistent estimator of μ in sampling from an $N(\mu, \sigma^2)$?
- (c) When would you say that the estimate of a parameter is good?
- (d) Define most efficient estimator.

11. Answer any one of the following : 2

- (a) Define minimum variance unbiased estimator (MVUE).
- (b) Let x_1, x_2, \dots, x_n be a random sample from $N(\mu, \sigma^2)$ population. Find sufficient estimators for μ and σ^2 .

12. Answer any one of the following : 5

- (a) Define point estimation. What are the criteria of a good estimator? 1+4=5



(6)

(b) A random sample $(x_1, x_2, x_3, x_4, x_5)$ of size 5 is drawn from a normal population with unknown mean μ . Consider the following estimators to estimate μ :

(i) $t_1 = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$

(ii) $t_2 = \frac{x_1 + x_2}{2} + x_3$

(iii) $t_3 = \frac{2x_1 + x_2 + \lambda x_3}{3}$

Find the value of λ such that t_3 is an unbiased estimator of μ . Are t_1 and t_2 unbiased? State giving reasons, the estimator which is best among t_1, t_2 and t_3 .

UNIT—V

13. Answer any three of the following as directed : 1×3=3

- (a) What is a likelihood function?
- (b) Define confidence interval.
- (c) What is the 95% confidence limit for parameter μ ?
- (d) The sample median is _____ estimate for the mean of normal population.

(Fill in the blank)

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14. Answer any one of the following : 2

- (a) In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators for μ when σ^2 is known.
- (b) State Cramer-Rao inequality.

15. Answer any one of the following : 5

- (a) Explain the method of maximum likelihood estimation. State the properties of maximum likelihood estimators. 2+3=5
- (b) State the regularity conditions for Cramer-Rao inequality. 5
