20/12/23

2023/TDC(CBCS)/ODD/SEM/
STSDSC/GE-301T/115

TDC (CBCS) Odd Semester Exam., 2023

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

SECTION—A

Answer *fifteen* of the following as directed, selecting *three* from each Unit : 1×15=15

UNIT—I

1. Define critical region.

2. What is statistical hypothesis?

3. Define level of significance.

4. Define parameter with an example.

UNIT—II

5. The significant value of z at 5% level of significance for one tailed test is ____.

(Fill in the blank)

6. What do you mean by sampling distribution of a statistic?

7. Define standard error.

8. State one utility of standard error.

UNIT—III

9. Define χ^2-variate with n degrees of freedom.

10. Write the p.d.f. of F-distribution with (n_1, n_2) degrees of freedom.

11. Define student's t-statistic.

12. Write the limit of F-distribution.

UNIT—IV

13. Define sufficiency.

14. State the sufficient conditions for consistency.

15. Define minimum variance unbiased estimator.

16. Define unbiasedness of an estimator.

UNIT—V

17. State Cramer-Rao inequality.

18. What is maximum likelihood estimation?

19. Cramer-Rao inequality with regard to the variance of an estimator provides ____ bound on the variance.

(Fill in the blank)

20. Write the formula for obtaining 95% confidence limit for the mean μ of a normal population $N(\mu, \sigma^2)$ with known σ.

SECTION—B

Answer *five* questions, selecting *one* from each Unit : 2×5=10

UNIT—I

21. Define simple and composite hypotheses with examples.

22. Define power function and power of a test.

UNIT—II

23. If $x_1, x_2, \cdots, x_n$ be a random sample of size n and $\bar{x}$ be the mean of the sample and μ be the mean of the population, then show that $E(\bar{x}) = \mu$.

24. Write the steps for testing of hypothesis.

UNIT—III

25. State the applications of t-distribution.

26. Write the test statistic for testing the significance of an observed sample correlation coefficient.

UNIT—IV

27. Define consistency of an estimator.

28. Define estimate and estimator.

UNIT—V

29. State the assumptions of maximum likelihood estimation.

30. Write a note on confidence interval.

SECTION—C

Answer *five* questions, selecting *one* from each Unit : 5×5=25

UNIT—I

31. *(a)* Define null and alternative hypotheses with examples. 2

(b) What do you mean by one-tailed and two-tailed test? Give examples. 3

32. Define type–I and type–II errors. Also define critical value, population and sample with examples.

UNIT—II

33. *(a)* Obtain the test of significance for large samples for standard deviation. 2

(b) Write a short note on large sample test. 3

34. Obtain the large sample test for difference of standard deviations for two distinct populations.

UNIT—III

35. Obtain the m.g.f. of χ^2-distribution with n degrees of freedom and hence obtain mean and variance.

36. *(a)* Obtain the relation between t- and F-distribution. 2

(b) Obtain the test of significance of mean of a univariate normal population in case of small sample and write the confidence interval of population mean. 3

UNIT—IV

37. Define Neyman Factorization theorem. If $x_1, x_2, \cdots, x_n$ be a random sample from a Bernoulli population with parameter p, then prove that

$$\sum_{i=1}^{n} x_i$$

is a sufficient statistic for p. 1+4=5

38. State the properties of a good estimator. If T is an unbiased estimator of θ, then show that T^2 and $\sqrt{T}$ are biased estimators of θ^2 and $\sqrt{\theta}$ respectively. 1+4=5

UNIT—V

39. State and prove Neyman-Pearson lemma.

40. If a sufficient estimator exists, then prove that it is a function of maximum likelihood estimator (MLE).

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