



**2021/TDC/CBCS/ODD/
STSHCC-301T/112**

**TDC (CBCS) Odd Semester Exam., 2021
held in March, 2022**

STATISTICS

(3rd Semester)

Course No. : STSHCC-301T

**(Limit Laws, Testing of Hypothesis and
Sampling Distribution)**

Full Marks : 50

Pass Marks : 20

Time : 3 hours

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

SECTION—A

Answer any *ten* of the following questions : $2 \times 10 = 20$

1. Define convergence in probability.
2. State central limit theorem.
3. Define convergence almost surely and convergence in distribution.
4. Write a brief note on p -value.



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5. Define critical region and critical value.
6. Define sampling distribution of a statistic.
7. Define type-I and type-II errors and their probabilities.
8. Define simple and composite hypothesis with examples.
9. Write with examples one-tailed and two-tailed tests.
10. Define χ^2 -statistic and write its p.d.f.
11. State the conditions for validity of χ^2 -test.
12. Write the applications of χ^2 -distribution.
13. Define Student's t -test and write its p.d.f.
14. Write the applications of F -distribution.
15. State the applications of t -distribution.

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(Continued)

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SECTION—B

Answer any five of the following questions :

6×5=30

16. (a) State and prove De Moivre-Laplace central limit theorem. 4
(b) State the applications of central limit theorem. 2
17. (a) State and prove Chebyshev's inequality. 3
(b) State and prove weak law of large numbers. 3
18. (a) Obtain the p.d.f. of r -th order statistic. 3
(b) Show that the sampling distribution of the area under a probability density function between two-order statistics is independent of the form of the density function. 3
19. Derive the sampling distribution of the mean of a random sample drawn from a normal population. 6
20. (a) Write a short note on large sample test in test of significance. 4
(b) Explain level of significance and level of confidence. 2

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(Turn Over)



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(5)

21. (a) Describe the procedure for test of significance for difference of standard deviations for two distinct populations. 3
(b) Obtain the test of significance for large samples for difference between two proportions of two distinct populations. 3
22. (a) Obtain the m.g.f. of χ^2 -distribution with $nd.f.$ and hence obtain mean and variance. 4
(b) If X follows χ^2 -distribution with $nd.f.$, then prove that $Y = \frac{1}{2} \sim \gamma\left(\frac{n}{2}\right)$. 2
23. (a) If X and Y are independent χ^2 -variates with n_1 and n_2 degrees of freedom, then prove that
$$U = \frac{X}{Y} \text{ is a } \beta_2\left(\frac{n_1}{2}, \frac{n_2}{2}\right)$$
 variate. 3
(b) Obtain the mode of χ^2 -distribution with n degrees of freedom. 3
24. (a) Define Fisher's t -distribution and derive it. 4
(b) Obtain the relation between t - and F -distribution. 2

25. (a) Derive the relation between F - and χ^2 -distribution. 3
(b) Describe the t -test for single mean mentioning clearly the underlying assumptions. 3
