

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025
SEMESTER 4 : STATISTICS FOR MATHEMATICS AND COMPUTER APPLICATION
COURSE : 19U4CPSTA04 /19U4CRSTA04 : STATISTICAL INFERENCE

(For Regular 2023 Admission and Improvement/Supplementary 2022/2021/2020/2019 Admissions)

Time : Three Hours

Max. Marks: 75

(Use of scientific calculator and statistical tables are permitted)

PART A

(Each question carries 1 mark. Maximum marks from this part is 10)

1. The diameter of cylindrical rod is assumed to be normal with a variance of 0.04 cm. A sample of 50 rods has a mean diameter of 4.5 cm. Find the 95% confidence limits for population mean
2. Write a statistic for testing the mean of a normal distribution with unknown standard deviation.
3. The mean of a random sample of size 20 taken from a binomial distribution $B(10, p)$ is 7. Give an unbiased estimate of p
4. Define confidence coefficient?
5. What do you mean by the bias of an estimator of a parameter θ
6. Level of significance lies between ----- and -----
7. What do you mean by non parametric tests?
8. State Cramer-Rao inequality
9. What are the properties of a good estimator?
10. What do you understand by point estimation?
11. A sample of 12 specimen taken from a normal population is expected to have a mean $=50$. The sample has mean 64 with a variance 25. Write the test statistic for testing, $H_0: \mu = \mu_0$ $H_1: \mu \neq \mu_0$.
12. Distinguish between null and alternative hypothesis

PART B

(Each question carries 3 marks. Maximum marks from this part is 15)

13. Write down the test statistic and critical region for testing the mean of a population $H_0: \mu = \mu_0$ when the population variance is unknown
14. Distinguish between parametric and non parametric tests?
15. If 13.3, 14.7, 10.2, 8.3, 11.7, 17.6, 10.8 and 18.8 is a sample from the population which follows $U(a, b)$ write down an estimate for each of the parameters a and b .
16. How is an interval estimator different from a point estimator?
17. If 2.5, 4.2, 9.4, 7.3, 8.6, 11.2, 4.7, and 5.8 is a random sample from $N(\mu, \sigma)$, obtain an unbiased estimate of $\sigma^2 + 20$
18. What is the contribution of standard error in testing of hypothesis?
19. Derive the confidence interval for the difference of the means of two normal populations with known standard deviations?

PART C

(Each question carries 5 marks. Maximum marks from this part is 20)

20. Explain the method of moments and obtain the moment estimator of the parameters a and b in a rectangular distribution with p.d.f. $f(x) = \frac{1}{b-a}, a < x < b$
21. Let x_1, x_2, \dots, x_{19} be a sample of size 19 from a normal population $N(\mu, \sigma^2)$. Find the critical region C of size $\alpha = 0.05$ for testing $\sigma^2 = 30$ vs $\sigma^2 = 80$
22. What do you mean by a confidence interval? Derive a confidence interval for the difference of the means of two normal populations with known standard deviations
23. The number of defectives found in 4 periodical inspections of samples of size 200 from 3 production processes is given below. Examine whether the processes are identical

	Process		
	1	2	3
	4	6	7
	12	8	5
	10	14	6
Defectives	7	4	12

24. Define sufficient estimator. For a Poisson distribution with parameter θ , show that sample mean \bar{x} is a sufficient estimator of θ
25. Samples of sizes two are drawn from a population with values 14, 10, 5, 17, 9, 16, 20, 15. Suggest an unbiased estimate of the population mean and obtain its variance.

PART D

(Each question carries 10 marks. Maximum marks from this part is 30)

26. 1000 students at college level are graded according to their I.Q. and their economic conditions. Test whether there is any association between economic conditions and the level of I.Q.

		IQ Level		
		poor	average	good
Income Level	Poor	150	100	50
	Average	200	150	150
	good	50	100	50

27. (i) Give an example of an estimate which is consistent but biased (ii) Derive the 95% confidence limit for the proportion of binomial population.
28. Explain the two sample t-test. The daily wages (in Rs.) of some randomly selected workers from two firms of the same type are given below. On the basis of the samples, can it be concluded that the mean wages of the workers of the two firms are the same. Assume that the wages follow Normal distribution
 Sample I : 300, 350, 280, 320, 260, 340
 Sample II : 260, 400, 340, 280, 360, 350, 150, 280
29. Explain chi square test of independence. The following table gives data regarding election of Candidates to an office. Is attitude towards election influenced by economic status of workers? Test the hypothesis at 5% level.

Attitude towards election	Economic Status	
	Rich	Poor
Favourable	90	155
Not favourable	90	110