



Reg. No. : .....

Name : .....

**Third Semester B.Sc. Honours in Mathematics Degree  
(CBCSS – Supplementary/Improvement) Examination, November 2022  
(2017-2020 Admissions)  
BHM 304 : THEORY OF SAMPLING AND ESTIMATION**

Time : 3 Hours

Max. Marks : 60

## PART – A

Answer any 4 questions. Each question carries one mark. (4×1=4)

1. Define standard error.
2. The number of possible sample of size  $n$  out of  $N$  population units without replacement is
3. What is meant by unbiasedness of estimators ?
4. Define the size of a test.
5. Define critical region.

## PART – B

Answer any 6 questions. Each question carries two marks. (2×6=12)

6. Distinguish between parameter and statistic.
7. Explain the concept of interval estimation.
8. Describe the method of maximum likelihood estimation.
9. Define one-tailed and two-tailed test.
10. A sample of 400 is taken from a population where standard deviation is 16. Find the values of standard error and probable error.

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11. The mean of a sample of size 20 from a normal population  $N(\mu, 64)$  was found to be 81.2. Find 90% confidence interval for  $\mu$ .
12.  $X_1, X_2, \dots, X_n$  is a random sample from a population following poisson distribution with parameter  $\mu$ . Suggest any two unbiased estimators of  $\mu$ .
13. Find the correction factor if  $n = 5$  and  $N = 100$ .
14. A coin was tossed 400 times and head turns up 212 times. Discuss whether the coin may be unbiased.

## PART – C

Answer any 8 questions. Each question carries four marks. (8×4=32)

15. The mean of a certain normal population is equal to the standard error of mean of the sample of size 64 from the distribution. Find the probability that the mean of the sample size 36 will be negative.
16. In two colleges affiliated to a university 46 out of 200 and 48 out of 250 candidates failed in an examination. If the percentage of failure in the university is 18%, examine whether the college differ significantly. (Significance level  $\alpha = 0.05$ )
17. Examine whether the sample mean  $\bar{x}$  is sufficient for estimating the parameter  $\mu$  in a poisson distribution.
18. A sample of 400 men from South India has a mean height of 65.85 inches and standard deviation of 2.50 inches while a sample of 100 men from North India has mean height of 66.20 inches with a standard deviation of 2.52 inches. Do the data indicate that North Indian are on the average taller than the South Indians.
19. A population consists of four values 2, 4, 6, 8. Draw all samples of size 2 with replacement. Verify that the sample mean is an unbiased estimator of the population mean.
20. The records of a certain hospital showed the birth of 723 males and 617 females in a certain week. Do these conform to the hypothesis that the sexes are born in equal proportions.
21. Write the main steps in a statistical test procedure.



22. In a random selection of 50 of 600 road crossings in a town, the mean number of automobile accidents per year was found to be 3.8 and the sample standard deviation was 0.8. Construct a 95% confidence interval for the mean number of automobile accidents per crossing per year.
23. Let  $x_1, x_2, \dots, x_n$  be a random sample from  $n(\mu, \sigma^2)$  population. Find sufficient estimator for  $\mu$  and  $\sigma^2$ .
24. A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that the mean of a sample of size 900 will be negative.
25. Define stratified random sampling and systematic sampling.
26. Examine whether the sample variance is an unbiased estimate of the population variance for a normal population  $N(\mu, \sigma)$ .

## PART – D

Answer any 2 questions. Each question carries six marks. (2×6=12)

27. What are the most important desirable properties of a good estimate ? Define them.
28.  $X_1, X_2, \dots, X_n$  is a random sample from a normal population  $N(\mu, \sigma)$ .  $t_1 = X_1$ ,  $t_2 = (X_1 + X_2)/2$ ,  $t_3 = (X_1 + X_2 + X_3)/3, \dots, t_n = (x_1 + x_2 + \dots + x_n)/n$  are proposed as estimates of  $\mu$ . Examine whether the estimates are unbiased and compare their efficiencies.
29. State and prove central limit theorem.
30. Write the test procedure for testing the significance for the difference of proportion of two large samples.