

Reg. No. : .....

Name : .....

**III Semester B.Sc. Honours in Mathematics Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/Improvement) Examination, November 2023 (2021 and 2022 Admissions)**

**3B12 BMH : ADVANCED STATISTICAL TECHNIQUES – I**

Time : 3 Hours

Max. Marks : 60

## SECTION – A

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

1. Regression coefficients are independent of change of \_\_\_\_\_ but not of \_\_\_\_\_.
2. When the ranks of two groups are same, then the rank correlation coefficient is \_\_\_\_\_.
3. Define standard error.
4. Distinguish between null hypothesis and alternative hypothesis.
5. Give the 95% confidence limits for  $\mu$ .

## SECTION – B

Answer any 6 questions out of 9 questions. Each question carries 2 marks. (6×2=12)

6. Explain the term curve fitting.
7. Prove that two independent variables are uncorrelated.
8. Define Linear regression and curvilinear regression.
9. Can  $Y = 5 + 2.8X$  and  $X = 3 - 0.5Y$  be the estimated regression equations of Y on X and X on Y respectively? Explain your answer with suitable theoretical arguments.

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10. Distinguish between parameter and statistic.
11. Define critical value. What are the factors that affect critical value?
12. Prove that the sample mean  $\bar{x}$  is an unbiased estimate of the population mean  $\mu$ .
13. The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance).
14. The mean muscular endurance score of a random sample of 60 subjects was found to be 145 with a s.d. of 40. Construct a 95% confidence interval for the true mean.

## SECTION – C

Answer any 8 questions out of 12 questions. Each question carries 4 marks. (8×4=32)

15. Write a note on Fitting of a Power Curve  $Y = aX^b$  to a set of n points.
16. Ten competitors in a musical test were ranked by the three judges A, B and C in the following order.

Rank by A	1	6	5	10	3	2	4	9	7	8
Rank by B	3	5	8	4	7	10	2	1	6	9
Rank by C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method discuss which pair of judges has the nearest approach to common likings in music.

17. Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y).

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

18. Write any two properties of regression coefficients.

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19. Explain the following :
  - a) Correlation coefficient
  - b) Positive correlation
  - c) Negative correlation
  - d) Perfect correlation.
20. Write a note on Fitting of second degree parabola  $Y = a + bX + cX^2$  to set of n points.
21. In two large populations, there are 30 and 25 per cent respectively of blue eyed people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations? (Test at 5% level of significance).
22. A dice is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the dice cannot be regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 lies.
23. Prove that  $S^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$  is an unbiased estimate of the population variance  $\sigma^2$ .
24. A sample of 900 members has a mean 3.4 cms and s.d. 2.61 cms. Is the sample from a large population of mean 3.25 cms and s.d. 2.61 cms? (Test at 5% level of significance).
25. A survey is proposed to be conducted to know the annual earnings of the old Statistics graduates of Delhi University. How large should the sample be taken in order to estimate the mean annual earnings within plus and minus Rs. 1,000 at 95% confidence level? The standard deviation of the annual earnings of the entire population is known to be Rs. 3,000.
26. The mean height of 50 male students who showed above average participation in college athletics was 68.2 inches with a standard deviation of 2.5 inches; while 50 male students who showed no interest in such participation had a mean height of 67.5 inches with a standard deviation of 2.8 inches. Test the hypothesis that male students who participate in college athletics are taller than other male students. (Test at 5% level of significance).