

U.G. 1st Semester Examination - 2020

STATISTICS

[HONOURS]

Course Code : STAT-H-/CC-T-1

(Descriptive Statistics)

Full Marks : 50 (40+10)

Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Notations and symbols have their usual meaning.

1. Answer any **five** of the following: $2 \times 5 = 10$
 - a) In case of perfect disagreement, find the variance of the rank differences for n individuals in the absence of any tie.
 - b) Distinguish between nominal and ordinal scale of measurement.
 - c) What are quartiles? Define inter-quartile range.
 - d) If a variable assumes values a and b and $(n-2)$ other values are all equal to $(a+b)/2$, find the mean deviation about mean.

- e) Show that Paasche's price index number may be looked upon as weighted average of price relatives.
- f) Define odds ratio.
- g) The two regression lines for two variables x and y are $4x - 6y + 23 = 0$ and $14x - 6y - 32 = 0$. If the variance of x is 81, find the variance of y .
- h) Suggest two measures of skewness, one ranging between -1 and $+1$, and the other between -3 and $+3$. Justify the range for any one of them.

2. Answer any **two** of the following: $5 \times 2 = 10$
 - a) Describe how one can use Box-plots to compare two frequency distributions.
 - b) Why is Laspeyres' index said to have an upward bias? What other unsatisfactory features does it have?
 - c) Suppose a variable x assumes only two distinct values with equal frequency. Find a relation between the standard deviation and range of x . Does this relation hold universally? Justify your answer with appropriate reasoning.

- d) Suppose two qualitative characters are categorized in a 2×2 contingency table. Suggest a suitable measure of association between them. Justify whether your suggested measure can be useful when one of the characters is quantitative.

3. Answer any **two** of the following: $10 \times 2 = 20$

- a) i) Prove that $b_2 \geq b_1 + 1$. 5
- ii) Give one example where the response 'y' is binary and the independent variable 'x' is continuous. Construct an appropriate regression equation of 'y' on 'x'. 5
- b) i) Suppose $x_1, x_2, \dots, x_n$ are n positive observations of a variable x , and A is their arithmetic mean. Show that the arithmetic mean of the logarithms of these observations cannot exceed $\log_e A$. 5
- ii) Suppose M_1 and M_2 be the medians of two groups having n_1 and n_2 observations, respectively. If M be the median of the combined group, show that M lies between M_1 and M_2 . 5

- c) i) What purpose is served by an index number? What are the different tests of consistency that a price index number should satisfy? 5
- ii) Show that the Mean Deviation about Mean cannot exceed the Standard Deviation. When are the two equal? 5
- d) What is 'residual variance' in linear regression? Obtain, using the method of least squares, an expression for it in terms of product-moment coefficient of correlation ' r ' and hence obtain the range of ' r '. Discuss how the square of the correlation coefficient can be used as a measure of the efficiency of the regression. 10

[Internal Assessment : 10]
