2019

STATISTICS

(Honours)

Paper : STA-HC-1016

(Descriptive Statistics)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following as directed : 1×7=7

(a) Data taken from the publication, *Agricultural Situation in India* will be considered as

(i) primary data

(ii) secondary data

(iii) neither primary nor secondary data

(iv) None of the above

(Choose the correct option)

(b) The point of intersection of the 'less than' and 'more than' ogive corresponds to ____.

(Fill in the blank)

(c) The algebraic sum of the observations of a series of individual observations from their mean is always zero.

(State True or False)

(d) The 25th percentile is same as ____ quartile.

(Fill in the blank)

(e) State the limits of correlation coefficient.

(f) In Paasche's index number, the weights taken are

(i) the base year quantities

(ii) the current year quantities

(iii) the base year price

(iv) None of the above

(Choose the correct option)

(g) If one regression coefficient is greater than unity, then the other must be ____ unity.

(Fill in the blank)

2. Answer the following questions : 2×4=8

(a) Distinguish between quantitative and qualitative data.

(b) The arithmetic mean of 10 observations were found to be 6. Later on it was found that a value was wrongly written as 4 instead of 5. Find the correct arithmetic mean.

(c) Define multiple correlation and partial correlation in case of a trivariate distribution.

(d) State time-reversal test and factor-reversal test used in index number.

3. Answer any *three* of the following : 5×3=15

(a) Write an explanatory note on box-plot. 5

(b) The first of the two samples has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15·6 and standard deviation $\sqrt{13 \cdot 44}$, find the standard deviation of the second group. 5

(c) The first four moments of a distribution about the value 4 of the variate are −1·5, 17, −30 and 108. Find the moments about mean and β_1. Also find the moments about the origin. 2+1+2=5

(d) Show that, if X' and Y' are the deviations of the random variables X and Y from their respective means, then

$$r = 1 - \frac{1}{2N}\sum_{i=1}^{n}\left(\frac{X_i'}{\sigma_x} - \frac{Y_i'}{\sigma_y}\right)^2$$

where r is the product moment correlation coefficient, N is the total number of observations, σ_x and σ_y are the respective standard deviations of X and Y. Hence deduce that $r \leq 1$. 4+1=5

(e) What is price relative? Prove that Fisher's index number lies between Laspeyre's and Paasche's index numbers. 1+4=5

4. Answer either *(a)* or *(b)* :

(a) (i) Distinguish between nominal and ordinal data. 2

(ii) Discuss about the graphical representation of statistical data. 5

(iii) Prove that correlation coefficient is the geometric mean of regression coefficients. 3

(b) (i) How, in your opinion, should an arithmetic mean change when all values of the variable are increased by the same amount? 1

(ii) What do you mean by the method of least squares? Discuss the method to fit the equations of the types $y = ab^x$ and $y = ax^b$. 1+2+2=5

(iii) What is a chain-base index number? State briefly its advantages over a fixed-base index number. 1+3=4

5. Answer either (a) or (b) :

(a) (i) Explain how the median of a distribution can be located graphically. (Draw a rough sketch to demonstrate the same) 4

(ii) Write a brief note on kurtosis. 3

(iii) State the problems that arise in the construction of index number. 3

(b) (i) Give the idea of cross-validation of data. 3

(ii) Define cost of living index number (CLIN). Interpret the result— "CLIN=120·5". 1+1=2

(iii) Define factorial moments. Express the first four factorial moments about origin in terms of raw moments. 1+4=5

6. Answer either (a) or (b) :

(a) (i) What is skewness? Discuss the different relative measures of skewness. 1+3=4

(ii) "Index numbers are economic barometers." Elucidate. 2

(iii) With usual notations of complete, partial and multiple correlation, prove that

$$1 - R^2_{1\cdot 23} = (1 - r^2_{12})(1 - r^2_{13\cdot 2})$$ 4

(b) (i) Explain briefly the uses and limitations of index number. 5

(Continued)

(ii) Prove that Spearman's rank correlation coefficient (ρ) is given by

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$$

where d_i denotes the difference between the ranks of the ith individual. 5

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