1 SEM TDC STSH (CBCS) C 1 (N/O)

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(November)

STATISTICS

(Core)

Paper : C–1

(Descriptive Statistics)

*The figures in the margin indicate full marks
for the questions*

(New Course)

<u>Full Marks</u> : 55
<u>Pass Marks</u> : 22

Time : 3 hours

1. Choose the correct answer from the following
   alternatives :   1×5=5

   (a) Temperature in degree celsius is
       measured on

       (i) nominal scale

       (ii) ordinal scale

       (iii) interval scale

       (iv) ratio scale

(*Turn Over*)

(b) For comparing variability of two series, one should calculate

(i) coefficient of correlation

(ii) coefficient of variation

(iii) coefficient of quartile deviation

(iv) semi-interquartile range

(c) If the kurtosis of a distribution is 3, it is called

(i) frequency distribution

(ii) probability distribution

(iii) negatively skewed distribution

(iv) normal distribution

(d) The coefficient of correlation between x and y is 0·6. Their covariance is 4·8. If the variance of x is 9, then the SD of y is

(i) $\dfrac{4 \cdot 8}{3 \times 0 \cdot 6}$

(ii) $\dfrac{0 \cdot 6}{4 \cdot 8 \times 3}$

(iii) $\dfrac{3}{4 \cdot 8 \times 0 \cdot 6}$

(iv) $\dfrac{4 \cdot 8}{9 \times 0 \cdot 6}$

(e) Index for base period is always taken as

(i) 100

(ii) 1

(iii) 200

(iv) 0

2. Answer the following questions in brief :   2×5=10

(a) Distinguish between quantitative data and qualitative data.

(b) For two values x_1 and x_2, prove that AM ≥ GM ≥ HM.

(c) Write down the Bowley's formula for measuring skewness.

(d) Why are there two lines of regression?

(e) Define price relative and quantity relative.

3. Answer any *one* of the following questions :   7

(a) Explain various types of measurement scale with suitable examples.

(b) Name four different graphs used for presenting statistical data and discuss one of them in detail.   4+3=7

(4)

(c) State the conditions of consistency for two attributes A and B. Give the criterion of independence for these two attributes. Show that, if

$$\frac{(A)}{N} = x, \frac{(B)}{N} = 2x, \frac{(C)}{N} = 3x \text{ and}$$

$$\frac{(AB)}{N} = \frac{(BC)}{N} = \frac{(CA)}{N}$$

then the value of neither x nor y can exceed $\frac{1}{4}$.

2+2+3=7

4. Answer any *two* of the following questions :

7×2=14

(a) What do you understand by skewness? Distinguish clearly, by giving figures, between positive and negative skewness showing the relative positions of mean, median and mode for positively and negatively skewed distributions. Pearson's coefficient of skewness of a distribution is 0·32, its SD = 6·5 and mean is 29·6. Find the mode of the distribution.

2+3+2=7

(b) If G_1 and G_2 are geometric means (GM) of two series of sizes n_1 and n_2 respectively, then show that (GM) of the combined series is

$$\log G = \frac{n_1 \log G_1 + n_2 \log G_2}{n_1 + n_2}$$

(5)

(c) Establish the relationship between central moments in terms of raw moments. The first two moments of a distribution about the value 5 of the variable are 2 and 20 respectively. Find the mean and variance.

5+2=7

5. Answer any *two* of the following questions :

6×2=12

(a) Show that in usual notation, the multiple correlation coefficient $R_{1\cdot23}$ is given by

$$R^2_{1\cdot23} = 1 - \frac{w}{w_{11}}$$

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

$$1 - \frac{6\Sigma d_i^2}{n^3 - n}$$

where d_i denotes the difference between the ranks of the ith individual. Also mention one advantage of Spearman's rank correlation coefficient.

5+1=6

(c) If $5x - 8y + 300 = 0$ and $10y - 4x - 510 = 0$ are the estimated regression equations of x on y and y on x respectively with $\text{var}(y) = 9$, then find the correlation coefficient r_{xy} and $\text{var}(x)$. Is it possible to consider the equations as regression of y on x and x on y respectively? Justify your answer.

4+2=6

6. *(a)* What are Laspeyre's, Paasche's and Fisher's index numbers? Prove that Fisher's index number lies between Laspeyre's and Paasche's index numbers. 3+4=7

Or

(b) What is meant by consumer's price index number? Discuss briefly the main steps in the construction of consumer's price index number. 2+5=7

(Old Course)

Full Marks : 50
Pass Marks : 20

Time : 2 hours

1. Choose the correct answer from the following alternatives : 1×5=5

(a) With the help of histogram we can prepare

   (i) frequency polygon

   (ii) frequency curve

   (iii) frequency distribution

   (iv) All of the above

(b) Sum of squares of deviation about mean is

   (i) maximum

   (ii) minimum

   (iii) zero

   (iv) None of the above

(c) If the coefficient of kurtosis γ_2 of a distribution is zero, the frequency curve is

   (i) leptokurtic

   (ii) platykurtic

   (iii) mesokurtic

   (iv) Any of the above

(d) If one regression coefficient of the two regression lines is greater than unity, the other will be

(i) greater than 1

(ii) 1

(iii) less than 1

(iv) $\frac{1}{2}$

(e) Index numbers are expressed

(i) in percentages

(ii) in ratios

(iii) in terms of absolute value

(iv) All of the above

2. Answer the following questions in brief :

2×5=10

(a) Differentiate between qualitative and quantitative data with examples.

(b) What are the merits of arithmetic mean?

(c) What are the requisites of a good measure of dispersion?

(d) Explain why there are two lines of regression.

(e) Write the advantages of chain-base indices.

3. (a) What are the different measuring scales used in Statistics? Illustrate each of them with examples. 7

Or

(b) What do you mean by cumulative frequency curve or ogive? What are the different types of ogive? Check whether the following cases of data is consistent or not. 2+2+3=7

$(A) = 300, (B) = 600, (AB) = 100, (N) = 1000$

4. Answer any *two* of the following questions :

(a) What do you understand by measures of central tendency? What are the major classifications of averages? There are $(n + 1)$ observations in a sample. If $\bar{x}_1$ is the mean of the first n numbers and $\bar{x}_2$ is the mean of the last n numbers, prove that

$$\bar{x}_2 = \bar{x}_1 + \frac{1}{n}(x_{n+1} - x_1)$$ 2+2+3=7

(b) What are the uses of dispersion? Define quartile deviation. What is coefficient of variation and its importance? 2+2+3=7

(c) Give relations of the first four central moments with the raw moments. What purpose is served by measuring skewness? What are the standard measures of skewness and kurtosis given by Karl Pearson? 3+2+2=7

5. (a) Show that correlation coefficient is independent of change of origin and scale. The following informations are available for three variables x_1, x_2 and x_3 :

$$r_{12} = -0 \cdot 89 \quad r_{13} = -0 \cdot 97 \quad r_{23} = 0 \cdot 96$$

$$\sigma_1 = 4 \cdot 24 \quad \sigma_2 = 5 \cdot 29 \quad \sigma_3 = 28 \cdot 31$$

Calculate the partial regression coefficients for a regression equation of x_1 on x_2 and x_3. 4+3=7

Or

(b) Can $Y = 5 + 2 \cdot 8 X$ and $X = 3 - 0 \cdot 5 Y$ be the estimated regression equations of Y on X and X on Y respectively? Explain your answer with suitable theoretical arguments. Determine the normal equations for fitting the exponential curve $Y = ab^X$, where a and b are constants. 4+3=7

(Continued)

6. (a) "Index numbers are economic barometers." Elucidate the statement. Show that Fisher's index number satisfies both time-reversal test and factor-reversal test. 2+5=7

Or

(b) What do you mean by consumer price index? Discuss the various steps in the construction of consumer price index. 2+5=7

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