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1 SEM TDC STS M 1 (N/O)

2018

(November)

STATISTICS

(Major)

Course : 101

(Descriptive Statistics)

Time : 3 hours

The figures in the margin indicate full marks for the questions

(New Course)

Full Marks : 80
Pass Marks : 24

1. Choose the correct answer : 1×8=8

   (a) The scale which does not possess any of the three attributes such as magnitude, equal intervals and absolute zero point is a/an

   (i) ordinal scale

   (ii) nominal scale

   (iii) interval scale

   (iv) ratio scale

(b) For the mid values given below

25, 34, 43, 52, 61, 70

the first class of the distribution is

(i) 24·5–34·5

(ii) 25–34

(iii) 20–30

(iv) 20·5–29·5

(c) A train covered the first 5 km of its journey at a speed of 30 km per hour and next 15 km at a speed of 45 km per hour. The average speed of the train was

(i) 35 km/h

(ii) 40 km/h

(iii) 32 km/h

(iv) 42 km/h

(d) The value of coefficient of kurtosis β_2 can be

(i) less than 3

(ii) greater than 3

(iii) equal to 3

(iv) All of the above

(e) The two regression lines always pass through the point

(i) $(\overline{X}, \overline{Y})$

(ii) (0, 0)

(iii) $(0, \overline{Y})$

(iv) $(\overline{X}, 0)$

(f) If β_{YX} and β_{XY} are two regression coefficients, they have

(i) same sign

(ii) opposite sign

(iii) either same or opposite sign

(iv) Nothing can be said

(g) The range of a partial correlation coefficient is

(i) 0 to 1

(ii) 0 to ∞

(iii) -1 to 1

(iv) $-\infty$ to ∞

(h) With two attributes, one can have in all

(i) two class frequencies

(ii) four class frequencies

(iii) eight class frequencies

(iv) nine class frequencies

2. (a) State which of the following represent(s) discrete data and which represent(s) continuous data : 2

(i) Number of inches of rainfall in a city during various months of the year

(ii) Speed of a car in mile/hr

(iii) Number of ten-rupee notes circulating in India at any time

(iv) Annual incomes of college professors

(b) Distinguish between an attribute and a variable. 2

(c) What are the characteristics of statistics? 4

3. (a) Explain with examples, the various measurement scales used in statistics. 6

Or

(b) What do you mean by bar diagram? Describe the different types of bar diagram and the situations and techniques of applying them. 6

4. Prove that for any two positive quantities

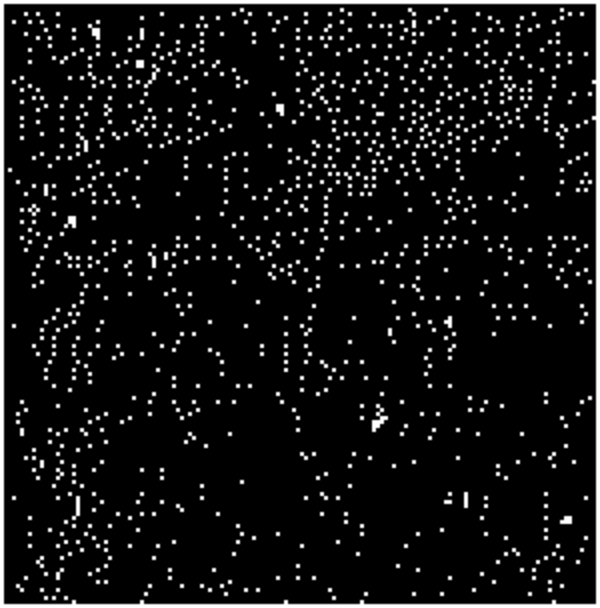
$$AM \geq GM \geq HM$$ 3

5. Answer any *three* of the following : 8×3=24

(a) Prove that the sum of the squares of deviations is minimum when deviations are measured from the mean. The algebraic sum of the deviations of 25 observations measured from 45 is 55. Find the AM of the observations. 5+3=8

(b) Obtain the standard deviation of the first n natural numbers. Prove that the standard deviation is independent of any change of origin but is dependent on change of scale. 3+5=8

(c) Express the second, third and fourth central moments in terms of raw moments. The first three moments of a distribution about the value 2 of a variable x are 1, 16 and −40. Find the mean, variance and third central moment. 4+1+1+2=8



(d) With the help of rough diagrams, show the different types of skewness and kurtosis indicating their names. In usual notations, show that for discrete distribution $\beta_2 \geq \beta_1$. 8

6. (a) What is a scatter diagram? Indicate by mean of suitable scatter diagrams for perfect correlation between the variables in bivariate data. 2+1=3

(b) Obtain the normal equations for fitting of geometric curve. 3

7. Answer any *two* of the following : 8×2=16

(a) Define Spearman's rank correlation coefficient and discuss its important advantages. In a contest, two judges ranked seven candidates in order of their preferences as in the following table :

Candidates	:	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Ranks by judge I	:	2	1	4	5	3	7	6
Ranks by judge II	:	3	4	2	5	1	6	7

Calculate the rank correlation coefficient. 2+3+3=8

(b) Obtain the equations of the two lines of regression for a bivariate distribution. Explain why we have two regression lines and why these lines are identical if *r* the correlation coefficient is +1 or –1. 5+2+1=8

(Continued)

(c) Distinguish between multiple and partial correlations. Show that for a trivariate distribution, the multiple correlation can be expressed as

$$1 - R^2_{1(23)} = (1 - r^2_{12})(1 - r^2_{13\cdot 2})$$ 3+5=8

8. (a) Explain the meaning of independence of two attributes A and B and give a criterion for their independence. If $\delta = (AB) - (AB)_0$, then with usual notations prove that

$$[(A) - (\alpha)][(B) - (\beta)] + 2N\delta = (AB)^2 + (\alpha\beta)^2 - (A\beta)^2 - (\alpha B)^2$$

1+3+5=9

Or

(b) Define Yule's coefficient of association and the coefficient of colligation. Establish the following relation between coefficient of association Q and coefficient of colligation Y :

$$Q = \frac{2Y}{1 + Y^2}$$

What is the range of values for Q?

2+2+4+1=9

(Old Course)

Full Marks : 80
Pass Marks : 32

1. State True or False : 1×8=8

(a) A questionnaire is filled up by the respondent.

(b) In drawing histograms, the class intervals should be continuous.

(c) Median cannot be calculated for frequency distribution having open-end classes.

(d) Mean deviation is minimum when calculated from the median.

(e) Coefficient of skewness is greater than unity.

(f) When one regression coefficient is positive, then other would be positive.

(g) Both regression lines of Y on X and of X on Y do not intersect at all.

(h) Square of the Yule's coefficient of association cannot exceed 1.

(Continued)

2. Answer the following in brief : 4×4=16

(a) Differentiate between the following :

(i) Qualitative data and Quantitative data

(ii) Primary data and Secondary data

(b) What do you mean by median of a frequency distribution? How do you determine it graphically?

(c) Define coefficient of variation. State its applications.

(d) Show that correlation coefficient is independent of change of origin and scale.

3. Answer any *two* of the following : 7×2=14

(a) What is statistical data? What are the points to be considered in classification of statistical data? Define population and sample with reference to statistics. Give example. 4+3=7

(b) What are the different measuring scales to measure statistical data? Explain each of them with examples. 7

(c) How do you define chart, diagram and graph? What are the advantages of charts, diagrams and graphs? 3+4=7

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

(a) Prove that AM ≥ GM ≥ HM. 5

(b) What are the characteristics for an ideal measure of dispersion? Write the names of different measures of dispersion. Give the main differences between mean deviation and standard deviation. 2+2+1=5

(c) What are raw moments and central moments? Establish the relationship between central moments in terms of raw moments. 2+3=5

(d) State the order in which mean, median and mode of a distribution lie for a positively skew-frequency distribution. A frequency distribution gives the following results :

Coefficient of variation (CV) = 5
Karl Pearson's coefficient of skewness = 0·5
Standard deviation = 2

Find mean and mode of the distribution. 2+3=5

5. Answer any *three* of the following : 6×3=18

(a) What do you mean by positive correlation and negative correlation? Show that $-1 \leq r \leq 1$, where r is the correlation coefficient. 2+4=6

(b) Define Spearman's rank correlation coefficient. Prove that for non-tied case, the Spearman's formula for rank correlation coefficient is

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$$ 2+4=6

(c) What is the relationship between correlation coefficient and regression coefficient? Two lines of regression are

$$x + 2y - 5 = 0 \text{ and } 2x + 3y - 8 = 0$$

and $\text{var}(x) = 12$. Calculate $\bar{x}$, $\bar{y}$, $\sigma^2 y^2$ and r. 2+4=6

(d) Show that the multiple correlation coefficient $R_{1\cdot 23}$ in usual notation is given by

$$R^2_{1\cdot 23} = 1 - \frac{\omega}{\omega_{11}}$$ 6

6. Answer any *one* of the following : 9

(a) What are the conditions of consistency for two attributes A and B? Name different measures of association and discuss any one of them. What is odd ratio? Explain with an example. 2+4+2+1=9

(b) Define Yule's coefficient of association and the coefficient of colligation. Establish the following relation between coefficient of association Q and the coefficient of colligation Y : 3+3+3=9

$$Q = \frac{2Y}{1+Y^2}$$

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