

BACHELOR OF ARTS EXAMINATION, 2025

1st Year, 2nd Semester

DEPARTMENT OF ECONOMICS (HONS.)

Subject Code : ARTS/ECO/B/C/2.2(OLD)

STATISTICAL METHODS FOR ECONOMICS

Time : Two Hours

Full Marks : 30

Answer Question no.1 and any two from the rest

[Note: All notations carry their usual meaning]

1. Answer **any four** from the following questions. 2.5×4=10
- (a) Show that if two variables x and y are linearly related in the form $y = a + bx$, then their medians are also related by the same relation.
- (b) The mean, median and the coefficient of variation of a distribution are respectively 45, 42 and 40%. Find the coefficient of skewness.
- (c) Show that quartile deviation is independent of change of origin but depends on change of scale.
- (d) Suppose a variable x takes only two values x_1 and x_2 with equal frequencies. Find the standard deviation of x .
- (e) Examine whether Fisher's ideal index satisfies the 'time reversal' test.
- (f) Calculate 5-yearly moving averages of the number of students studying in a college from the following data:

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| No. of Students | 332 | 317 | 357 | 392 | 402 | 405 | 410 | 427 | 405 | 431 |

- (g) If x_1 and x_2 are two positive values of a variable, prove that their geometric mean is equal to the geometric mean of their arithmetic and harmonic means.
- (h) If $4u = 2x + 7$ and $6v = 2y - 15$, and the regression coefficient of y on x is 3, then find the regression coefficient of v on u ?
2. (a) If a variable x takes the values $1, 2, \dots, r$ with F_1, F_2, \dots, F_r as the corresponding more-than type cumulative frequencies, then prove that $\bar{x} = \frac{1}{n} \sum_{i=1}^r F_i$, where n is the total frequency.
- (b) Show that standard deviation is the minimum root-mean-square deviation.
- (c) The mean and variance of a group of 100 observations are 6.5 and 3.0 respectively. 55 of these observations have mean 6.6 and standard deviation 1.5. Find the mean and standard deviation of the remaining 45 observations.

4+3+3=10

3. (a) If z is a function of two variables x and y such that $z = xy$, then show that geometric mean of z is similarly related to the geometric means of x and y .
 (b) Find the dispersion for the following data using a suitable measure

| Values | Frequency |
|--------------|-----------|
| Less than 15 | 4 |
| 15-20 | 12 |
| 20-25 | 16 |
| 25-30 | 22 |
| 30-40 | 10 |
| 40-50 | 8 |
| 50-60 | 6 |
| More than 60 | 4 |
| Total | 82 |

- (c) The first four moments of a distribution about the value 3 are 2, 10, 40 and 218 respectively. Find the first four moments about origin.

$$3+4+3=10$$

4. (a) Derive the formula for Spearman's rank correlation coefficient when there are no ties.
 (b) Find the regression equation of x on y for the following data:

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| x | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
| y | 5.3 | 5.7 | 6.3 | 7.2 | 8.2 | 8.7 | 8.4 |

- (c) With the help of the following data calculate price index number using Fisher's formula.

| Commodity | 1970 | | 1972 | |
|-----------|-------|----------|-------|----------|
| | Price | Quantity | Price | Quantity |
| A | 6 | 50 | 10 | 56 |
| B | 2 | 100 | 2 | 120 |
| C | 4 | 60 | 6 | 60 |
| D | 10 | 30 | 12 | 24 |
| E | 8 | 40 | 12 | 36 |

$$3+4+3=10$$

5. (a) In a moderately skewed distribution, the mean and the mode are respectively 24.6 and 26.1. Find the value of the median.
 (b) Out of the two regression lines given by $3x + 9y = 46$ and $3y + 12x = 19$ which one is the regression line of x on y ? If the variance of x is 4, calculate the variance of y .
 (c) Show that correlation coefficient lies between -1 and +1.

$$3+4+3=10$$
