

EX/ARTS/ECO/UG/SEC/21/201/2025

BACHELOR OF ARTS EXAMINATION, 2025

(2nd Year, 1st Semester)

ECONOMICS

PAPER : EX/ARTS/ECO/UG/SEC/21/201

(Statistical Methods in Economics)

Time : 2 Hours

Full Marks : 30

1. Answer *any one* question (CO1) : $3 \times 1 = 3$

(a) Draw the ogives of less than and more than types and estimate the value of the median from the ogives, based on the data given below.

Class Interval	15-21	22-28	29-35	36-42	43-49	50-56	57-63
Frequency	10	15	32	42	26	12	9

(b) Draw up a blank table in which the number of persons employed in six industries, on two different dates, distinguished males from females and among the latter, singles, married and widows.

2. Answer *any four* questions (CO2) : $3 \times 4 = 12$

(a) Calculate arithmetic mean and mode from the following cumulative frequency distribution of marks obtained by 22 students.

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
No. of Students	3	8	17	20	22

ECO-1119

[Turn Over]

(2)

- (b) In the following table, recorded data are showing the test scores made by 10 salesmen on an intelligence test and their weekly sales :

Salesmen	1	2	3	4	5	6	7	8	9	10
Test scores	50	70	50	60	80	50	90	50	60	60
Sales ('000 ₹)	25	60	45	50	45	20	55	30	45	30

Calculate the rank correlation coefficient between intelligence and efficiency in salesmanship.

- (c) For 5 pairs of values of x and y , the values of $(x + y)$ are 24, 28, 30, 33, 35 and variances of x and y are 6 and 2 respectively. Calculate the correlation coefficient between x and y .
- (d) After shift of origin and change of scale, a frequency distribution of a continuous variable (x) with equal class length takes the following form of frequency distribution of the changed variable (u) :

u	-3	-2	-1	0	1	2	3
Frequency	3	5	12	49	22	8	1

If the mean and standard deviation of the original frequency distribution are 56 and 11 respectively, find the original frequency distribution.

- (e) Fit a straight-line trend equation by the method of least squares and estimate the trend value for 1969.

Year	1960	1961	1962	1963	1964	1965	1966	1967
Value	380	400	650	720	690	600	870	930

(5)

- (d) If f_i, F_i, F_i' are respectively the frequency, less than type cumulative frequency, greater than type frequency of i^{th} class and N be the total frequency, then which of the following is *correct*?
- (i) $N = F_i + F_i'$
- (ii) $N = F_i + F_i' + f_i$
- (iii) $N = F_i + F_i' - f_i$
- (iv) None of the above
- (e) The sum of the two regression coefficients is 1.4 and the correlation coefficient is 0.75. Do you agree? Justify.
- (f) If x and y are two variables such that $y = \sqrt[3]{7}$ and H.M. of x is 7, find G.M. of y .
- (g) The sum of 20 observations is 100, find the least value of the sum of squares of these observations.
- (h) How many moving values are feasible when 4 yearly moving averages are calculated from 13 years of data?

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(3)

(f) Using the following data, show that Fisher's Ideal Index satisfies both the time reversal test and factor reversal test.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	10	50	12	60
B	8	30	9	32
C	6	35	6	40

3. Answer any three questions (CO3) : 3×3=9

(a) If a variable x takes the values $1, 2, \dots, r$ with the cumulative frequencies of less than type $F_1, F_2, \dots, F_r (= n)$, then prove that

$$\bar{x} = (r + 1) - \frac{1}{n} \sum_{i=1}^r F_i$$

(b) Suppose $u = cx + dy, v = cx - dy$ and r is the correlation coefficient between x and y . If u and v are uncorrelated, prove that $s_u s_v = 2cd s_x s_y \sqrt{1 - r^2}$ where s_i is the standard deviation of i^{th} variable.

(4)

(c) Prove that Spearman's rank correlation coefficient lies between -1 and $+1$.

(d) Let x_1, x_2, \dots, x_n be n observations with mean \bar{x} and standard deviation σ . Let m_r denote the r^{th} central moment of the above observations and let α_r denote the r^{th} central moment of z_1, z_2, \dots, z_n where $z_i = (x_i - \bar{x}) / \sigma$. Prove that $\alpha_r = m_r / \sigma^r$. Also, find the values of α_1 and α_2 .

(e) If the mean and variance of one set of values be \bar{x}_1, s_1^2 and those of another set be \bar{x}_2 and s_2^2 respectively and each set has n values, then prove that the variance (s^2) of the combined set of values is given by

$$4s^2 = 2(s_1^2 + s_2^2) + d^2$$

where, $d = \bar{x}_1 - \bar{x}_2$.

4. Answer any six questions (CO4) : 1×6=6

(a) When $r = 0$, what can you say about the regression lines?

(b) Suppose each value of a variable x lies between p and q , both values inclusive. Show that $p \leq \bar{x} \leq q$.

(c) Point out the mistake or ambiguity in the following statement : "A person goes from X and Y on cycle at 20 m.p.h and returns at 24 m.p.h. His average speed was 22 m.p.h."