**QP Code : 23/PT/11/II**

# POST-GRADUATE COURSE

## Term End Examination — June, 2023/December, 2023

## ECONOMICS

## Paper-II : STATISTICS FOR ECONOMICS

Time : 2 hours ] [ Full Marks : 50

Weightage of Marks : 80%

**Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.**

**Use of scientific calculator is strictly prohibited.**

1. Answer any *four* of the following questions : $2\frac{1}{2} \times 4 = 10$

   a) Clarify what do you mean by an attribute and a variable with the help of examples.

   b) Are the following data consistent ? Explain.

| Group | Number of observations | Mean |
|---|---|---|
| I | 40 | 85 |
| II | 50 | 95 |
| Combined | 90 | 69 |

   c) What do you mean by relative measures of dispersion ?

   d) If the regression coefficient of $X$ on $Y$ is – 1·6 and $Y$ on $X$ is – 0·4 then what is the correlation coefficient between $Y$ and $X$ ?

   e) Examine whether the following result is true or false :

   $P(A \cup B) \leq P(A)$

   f) Show that for a random variable $X$ following a binomial distribution with parameter $n$ and $p$, maximum variance is $n/4$.

2. Answer any *four* of the following questions : $5 \times 4 = 20$

   a) A variable takes only two distinct values $a$ and $b$, each with equal frequency. Find the 2nd and 3rd central moments.

b) For the following data show that $r = 0$. Do you conclude that $X$ and $Y$ are independent ? Why ?

| $X$ | – 3 | – 2 | – 1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $Y$ | 9 | 4 | 1 | 0 | 1 | 4 | 9 |

c) Show that correlation coefficient is independent of change in origin and scale.

d) Prove that the value of correlation coefficient lies between – 1 and + 1.

e) Given that $x = 4y + 5$ and $y = kx + 4$ are regression equations of $X$ on $Y$ and $Y$ on $X$ respectively. Show that $0 < k < 0{\cdot}25$. If actually $k = 0{\cdot}10$ find the means of the variables $X$ and $Y$ and also their coefficient of correlation.

f) The second moments about mean of two distributions are 9 and 16 while the third moments about mean are – 8·1 and – 12·8 respectively. Which distribution is more skewed to the left ? Give reasons.

3. Answer any *two* of the following questions : $10 \times 2 = 20$

a) i) For two observations $a$ and $b$ ( $a > 0$, $b > 0$ ) show that AM ≥ GM ≥ HM.

ii) Find a suitable measure of central tendency for the following distribution. Justify your answer.

| Class limit | Frequency |
|---|---|
| 51 - 55 | 4 |
| 56 - 60 | 10 |
| 61 - 65 | 14 |
| 66 and above | 2 |

b) i) Evaluate standard deviation as a measure of dispersion.

ii) In a factory average daily wage of 50 workers was Rs. 200 with a S.D. of Rs. 40. Each worker is given a hike of Rs. 20. What is the new average daily wage and S.D. ? If each worker is given a hike of 10% in wages how are the mean and S.D. affected ?

c) i) Consider the sample space $S = \{ e_1, e_2, e_3, e_4 \}$. Define the events $A = \{ e_1, e_3 \}$, $B = \{ e_2, e_3 \}$, $C = \{ e_3, e_4 \}$.

Are *A, B* and *C*

- pairwise independent ?

- mutually independent ?

What conclusion can you draw from your answer ?

ii) 3 lots contain respectively 10%, 20% and 25% defective articles. One article is drawn at random from each lot. What is the probability that among them there is exactly one defective ?

d) Explain at least five properties of Normal distribution. $2 \times 5$