## 3 SEM TDC ECOH (CBCS) C 7

## 2023

( Nov/Dec )

## ECONOMICS

( Core )

Paper : C–7

**( Statistical Methods for Economics )**

*Full Marks* : 80

*Pass Marks* : 32

*Time* : 3 hours

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

1. Answer the following as directed : 1×8=8

   (a) The 'root mean square deviation' from the arithmetic mean of a distribution is

   (i) quartile deviation

   (ii) mean deviation

   (iii) standard deviation

   (iv) None of the above

   (Choose the correct option)

*( Turn Over )*

(b)  A curve with a sharp peak and long tail is called

   (i) leptokurtic

   (ii) platykurtic

   (iii) mesokurtic

   (iv) None of the above

   (Choose the correct option)

(c)  If $r < PE$, correlation is significant.

   (Write True or False)

(d)  Poisson distribution is a limiting case of binomial distribution, when

   (i) $n \to \infty$

   (ii) $p \to 0$

   (iii) $np = m$ (a finite positive quantity)

   (iv) All of the above

   (Choose the correct option)

(e)  Mention one use of geometric mean.

(f)  The t-distribution is used, when sample size is

   (i) $\geq 30$

   (ii) $= 30$

   (iii) $\leq 30$

   (iv) None of the above

   (Choose the correct option)

( Continued )

(g) The probability of the entire sample space, i.e. $P(S)$ is _____.

(Fill in the blank)

(h) The value of $\sqrt{b_{xy} \times b_{yx}}$ is equal to

    (i) $r$

    (ii) $\rho$

    (iii) $R$

    (iv) $R^2$

(Choose the correct option)

2. Write short notes on any *four* of the following :     $4 \times 4 = 16$

    (a) Measures of skewness

    (b) Inverse probability

    (c) Properties of binomial distribution

    (d) Testing of hypothesis

    (e) Method of least squares

3. (a) (i) Prove that if $a$ and $b$ are two positive numbers, their $AM \geq GM \geq HM$.     6

    (ii) The mean marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean corresponding to the correct score.     5

*Or*

(b) Find the standard deviation from the following data. Also compute coefficient of variation :

7+4=11

| Income | No. of Persons |
|---|---|
| More than 100 | 0 |
| More than 90 | 5 |
| More than 80 | 11 |
| More than 70 | 20 |
| More than 60 | 40 |
| More than 50 | 60 |
| More than 40 | 70 |
| More than 30 | 85 |
| More than 20 | 90 |
| More than 10 | 100 |

4. (a) (i) Explain the addition theorem of probability using Venn diagrams in case of mutually exclusive events and events not mutually exclusive. 7

(ii) What is the probability that a leap year, selected at random, will contain 53 Sundays? 4

*Or*

(b) (i) Show that the sum of the probabilities of all possibilities in two independent events amounts to certainty. 5

*(ii)* A problem is given to 5 students of Economics. Their chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$. What is the probability that the problem will be solved?     6

**5.** *(a)* *(i)* Define a random variable and its mathematical expectation.     2+3=5

*(ii)* A dice is thrown in random. What is the expectation of the number on it?     6

*Or*

*(b)* *(i)* State the distinctive features of normal distribution.     5

*(ii)* Discuss the importance of Poisson distribution.     6

**6.** *(a)* Distinguish between sampling and census. Explain the special advantages of sampling technique and its limitations.     5+4+3=12

*Or*

*(b)* A certain drug is claimed to be effective in curing colds. In an experiment on 164 people with colds, half of them were given the drug and half of them were given sugar pills.

The patients' reactions to the treatment are recorded as given below :

|  | Helped | Harmed | No effect | Total |
|---|---|---|---|---|
| Drug | 52 | 10 | 20 | 82 |
| Sugar pills | 44 | 12 | 26 | 82 |
| Total | 96 | 22 | 46 | 164 |

Can it be concluded that there is a significant difference in the effect of the drug and sugar pills? (For $v = 2$, the table value of $\chi^2$ at 5% level of significance is 5·99) — 12

7. (a) You are given the following information about advertising and sales (in ₹ lakh) :

|  | Advertisement expenditure | Sales |
|---|---|---|
| Arithmetic mean | 10 | 90 |
| Standard deviation | 3 | 12 |

Correlation coefficient = 0·80

  (i) Calculate the two regression lines.
      3+3=6

  (ii) Find the likely sales when advertisement expenditure is ₹15 lakh. — 2

  (iii) What should be the advertisement expenditure if the company wants to attain a sale target of ₹120 lakh? — 3

( Continued )

*Or*

(b) The following data relate to age of employees and the number of days they were reported sick in a month :

Age (X)        : 30 32 35 40 48 50 52 55 57 61

Sick days (Y) : 1  0  2  5  2  4  6  5  7  8

Calculate Pearson's coefficient of correlation and interpret it.        9+2=11

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