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Reg. No. : ....

Code No. : 30737 E   Sub. Code : EEST 31

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

Third Semester

Mathematics

Elective — STATISTICS – I

(For those who joined in July 2023 onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A frequency distribution has positive skewness if

    (a) $\beta > 0$ (b) $\beta_2 = c$

    (c) $\beta_1 > 0$ (d) $\beta_2 > 0$

2. $\mu_3 =$ _____

    (a) $\mu_3^1 - 3\mu_2^1\mu_1^1 + 2\left(\mu_1^1\right)^3$ (b) $\mu_3^1 + 3\mu_2^1\mu_1^1 + 2\left(\mu_1^1\right)^3$

    (c) $\mu_3^1 - 3\mu_2\mu_1^1 + \left(2\mu_1^1\right)^3$ (d) $\mu_3^1 - 3\mu_2\mu_1 + 2\left(\mu_1^1\right)^3$

3. If γ is the correlation co-efficient between x and y, then

    (a) $\gamma > 1$ (b) $\gamma < -1$

    (c) $-1 \le \gamma \le 1$ (d) 0

4. The spearman's formula for rank correlation is _____

    (a) $1 - \dfrac{6\Sigma(x - y)^2}{n(n^2 - 1)}$ (b) $1 - \dfrac{6\Sigma(x + y)^2}{n(n^2 + 1)}$

    (c) $1 + \dfrac{6\Sigma(x - y)^2}{n(n^2 - 1)}$ (d) $1 - \dfrac{6\Sigma(x + y)^2}{n(n^2 - 1)}$

5. If $b_{xy} \ge 1$, then b_{yx} is always _____

    (a) <1 (b) >1

    (c) 0 (d) -1

6. The geometric mean of the regression co-efficient is _____

    (a) 0 (b) 1

    (c) γ (d) -1

7. For any 3 given attributes, total number of negative class frequency is _____

    (a) 6 (b) 8

    (c) 7 (d) 9

8. If the attributes A and B are completely associated, then the Yule's co-efficient of association $Q =$ _____

(a) 0   (b) 1

(c) -1 (d) 100

9. The value of price relative is given by

(a) $\dfrac{p_0}{p_1}$ (b) $\dfrac{p_1}{p_0}$

(c) $\dfrac{q_1}{q_0}$ (d) $\dfrac{q_0}{q_1}$

10. $L_{I_{01}} =$ _____

(a) $\dfrac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$ (b) $\dfrac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times 100$

(c) $\dfrac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$ (d) $\dfrac{\Sigma p_0 q_0}{\Sigma p_1 q_0} \times 100$

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Find (i) standard deviation (ii) mean deviation about mean (iii) co-efficient of variation for the following marks of 10 students. 20, 22, 27, 30, 40, 48, 45, 32, 31, 35.

Or

(b) The first four moments of a distribution about $x = 2$ are 1, 2.5, 5.5, 16. Find the four moments (i) about the mean (ii) about zero.

12. (a) Find the correlation co-efficient for the following.

x	10	12	18	24	23	27
y	13	18	12	25	30	10

Or

(b) Find the rank correlation co-efficient between Height and weight.

Height	165	167	166	170	169	172
Weight	61	60	63.5	63	61.5	64

13. (a) If $3x + 2y - 26 = 0$, $6x + y - 31 = 0$ are two regression lines then find (i) $\bar{x}, \bar{y}$ (ii) γ_{xy} (iii) σ_y if $\sigma_x = 5$.

Or

(b) Fit a straight line to the following data

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

14. (a) Find whether the following data are consistent? $N = 1000$, $(A) = 300$, $(B) = 400$, $(AB) = 50$.

Or

(b) Check whether the attributes A and B are independent given that

(i) $(A) = 30$, $(B) = 60$, $(AB) = 12$, $N = 150$

(ii) $(AB) = 256$, $(\alpha B) = 768$, $(A\beta) = 48$, $(\alpha\beta) = 144$.

15. (a) From the chain base index numbers given below, prepare fixed base index number.

Year	1985	1986	1987	1988
Chain base index number	105	108	110	107

Year		1989	1990	1991
Chain base index number		115	120	125

Or

(b) Find the cost of living index for 1992 on the base of 1991 from the following data using (i) family budget method (ii) aggregate expenditure method.

Commodity	Price		Quantity
	1991	1992	1991
A	7	7.5	6
B	6	6.75	3.5
C	5	5	0.5
D	30	32	3
E	8	8.5	1

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Find Karl Pearson's co-efficient of skewness for the following data.

Age	10-12	12-14	14-16	16-18
Students	4	10	16	30

Age	18-20	20-22	24-24	Total
Students	20	14	6	100

Or

(b) Mean and standard deviation of the marks of 2 classes of sizes 25 and 75 are given below.

	Class A	Class B
Mean	80	85
Standard deviation	15	20

Find combined mean and standard deviation of 2 classes.

17. (a) Let x, y be two variables with standard deviation σ_x, σ_y respectively. If $u = x + ky$, $v = x + \left(\dfrac{\sigma_x}{\sigma_y}\right)y$, $\gamma_{uv} = 0$, then, find the value of k.

Or

(b) From the following data, of marks obtained by 10 students in physics and chemistry. Calculate the rank correlation co-efficient.

Physics	35	56	50	65	44
Chemistry	50	35	70	25	35
Physics	38	44	50	15	26
Chemistry	58	75	60	55	35

18. (a) Show that the angle between the two regression lines is given by

$$\theta = \tan^{-1}\left[\left(\frac{\gamma^2 - 1}{\gamma}\right)\left(\frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\right)\right].$$

Or

(b) Fit the curve $y - ae^{bx}$ for the following data.

x	1	2	3	4	5	6
y	14	27	40	55	68	300

19. (a) Given $N = 1200$, $(ABC) = 600$, $(\alpha\beta\gamma) = 50$, $(\gamma) = 270$, $(A\beta) = 36$, $(\beta\gamma) = 204$, $(A) - (\alpha) = 192$ $(B) - (\beta) = 620$. Find the remaining ultimate class frequencies.

Or

(b) Find the greatest and least value of (ABC) if $(A) = 50$, $(B) = 60$, $(C) = 80$, $(AB) = 35$, $(AC) = 45$ and $(BC) = 42$.

20. (a) From the following data, construct an index number for 1970 taking 1969 as base year by price relatives method using (i) Arithmetic mean (ii) Geometric mean for averaging the relatives.

Commodities	Price 1969	Price 1970
A	150	170
B	40	60
C	80	90
D	100	120
E	20	25

Or

(b) Calculate (i) Laspeyer's (ii) Paasche's (iii) Fisher's index numbers for the following data given below.

Commodities	Base year 1990 Price	Base year 1990 Quantity	Current year 1992 Price	Current year 1992 Quantity
A	2	10	3	12
B	5	16	6.5	11
C	3.5	18	4	16
D	7	21	9	25
E	3	11	3.5	20