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Reg. No. :

Code No. : 20427 E

Sub. Code : CAST 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023

First/Third Semester

Mathematics — Allied

STATISTICS — I

(For those who joined in July 2021-2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answers.

1. For a symmetrical distribution

- (a) $\gamma_1 = 0$ (b) $\beta_1 = 0$
(c) $\beta_2 = 0$ (d) None

2. The number of normal equations to fit a parabola is

- (a) 1 (b) 2
(c) 3 (d) None

3. Which of the following is an example of positive correlation?

- (a) Income and Expenditure
(b) Price and demand
(c) Volume and pressure of a perfect gas
(d) None

4. The regression coefficient of x on y is

- (a) $\gamma \frac{\sigma_y}{\sigma_x}$ (b) $\frac{1}{\gamma} \frac{\sigma_y}{\sigma_x}$
(c) $\frac{1}{\gamma} \frac{\sigma_x}{\sigma_y}$ (d) $\gamma \frac{\sigma_x}{\sigma_y}$

5. The order of the total frequency N is _____.

- (a) 1 (b) 0
(c) ∞ (d) None

6. If $(A) = 30$, $(\alpha) = 30$ then $N =$ _____.

- (a) 40 (b) 50
(c) 60 (d) 70

7. In the m.g.f. of a r.v. X , the coefficient $\frac{t^r}{r!}$ is _____.

- (a) μ_r (b) μ'_r
(c) k_r (d) None



8. If φ denotes the characteristic function of a r.v. X , then $\varphi(0) = \underline{\hspace{2cm}}$.

- (a) 1 (b) 0
(c) ∞ (d) None

9. The mean of the binomial distribution is .

- (a) n (b) np
(c) npq (d) \sqrt{npq}

10. Variance of the normal distribution is .

- (a) μ (b) $\sqrt{\mu}$
(c) σ (d) σ^2

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Calculate Karl Pearson's Coefficient of Skewness for the following data :

Size : 10 11 12 13 14 15

Frequency : 2 4 10 8 5 1

Or

(b) Fit a straight line to the following data and estimate the value of y corresponding to $x = 6$.

x : 0 5 10 15 20 25
 y : 12 15 17 22 24 30

12. (a) Show that $-1 \leq \gamma \leq 1$.

Or

(b) Calculate the rank correlation coefficient for the following data :

x : 5 2 8 1 4 6 3 7
 y : 4 5 7 3 2 8 1 6

13. (a) Given the following ultimate class frequencies. Find the positive and negative class frequencies and the total number of observations.

$(AB) = 733$, $(A\beta) = 840$, $(\alpha B) = 699$,
 $(\alpha\beta) = 783$.

Or

(b) Check whether the following attributes are independent

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



14. (a) (i) Find the constant k such that the function $f(x) = \begin{cases} kx^2 & \text{if } 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$ is a probability function
- (ii) Compute $P(1 < X < 2)$
- (iii) Find the distribution function.

Or

- (b) Let X have the p.d.f.

$$f(x) = \begin{cases} \frac{x+2}{18} & \text{if } -2 < x < 4 \\ 0 & \text{otherwise} \end{cases}$$

Find

- (i) $E(X)$
- (ii) $E(X+2)^2$
15. (a) State and prove the addition property of a binomial distribution.

Or

- (b) If X is a Poisson variate with $P(X=1) = P(X=2)$, Find $P(X=4)$

PART C — ($5 \times 8 = 40$ marks)

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

16. (a) The first four moments of a distribution about $x = 4$ are -1.5 , 17 , -30 and 108 . Find the first four moments
- (i) about mean
- (ii) about the origin
- (iii) about $x = 2$
- (iv) Calculate β_1 and β_2 .

Or

- (b) Fit a curve $y = bx^a$ to the following data :

$x:$	1	2	3	4	5	6
$y:$	1200	900	600	200	110	50

17. (a) Find the correlation coefficient for the following data :

Marks in Maths :	65	66	67	67	68	69	70	72
Marks in Statistics :	67	68	65	68	72	72	69	71

Or



- (b) The two variables x and y have the regression lines $3x + 2y - 26 = 0$ and $6x + y - 31 = 0$.

Find :

- (i) the mean values of x and y
- (ii) the correlation coefficient between x and y
- (iii) the variance of y if the variance of x is 25

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

Or

- (b) Calculate the coefficient of association between intelligence of father and son from the following data :

Intelligent fathers with intelligent sons = 200

Intelligent father's with dull sons = 50

Dull father's with intelligent sons = 110

Dull father's with dull sons = 600

Comment on the result.

19. (a) Find the (i) mean (ii) median and (iii) mode for the following distribution

$$f(x) = \begin{cases} 6(x - x^2) & \text{if } 0 < x < 1 \\ 0 & \text{elsewhere} \end{cases}$$

Or

- (b) State and prove the properties of m.g.f.

20. (a) Derive the moments of the Binomial distribution.

Or

- (b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and S.D.

