

(8 pages)

Reg. No. :

Code No. : 20382 E

Sub. Code : CAST 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First/Third Semester

Mathematics – Allied

STATISTICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. The value of μ_3 is _____

- (a) $\mu_3 + 3\mu_2\mu_1' + \mu_1'^3$
- (b) $\mu_3 - 3\mu_2\mu_1' + \mu_1'^3$
- (c) $\mu_3 + 2\mu_2\mu_1' + \mu_1'^3$
- (d) $\mu_3 - 2\mu_2\mu_1' + \mu_1'^3$

2. _____ is not affected by change of origin but affected by change of scale.

- (a) arithmetic mean
- (b) median
- (c) moment
- (d) mode

3. If $\sum (x - \bar{x})^2 = 60$, $\sum (y - \bar{y})^2 = 90$, $\sum (x - \bar{x})(y - \bar{y}) = 45$, then the correlation coefficient between the variables x and y is _____

- (a) 0.6125
- (b) 0.1265
- (c) 0.5623
- (d) 0.2516

4. If X and Y are uncorrelated, $\text{cov}(X, Y) = \text{_____}$

- (a) 0
- (b) 1
- (c) -1
- (d) ∞

5. If $Q = 0$, then $Y = \text{_____}$

- (a) 1
- (b) 0
- (c) -1
- (d) $-\infty$

6. For any given three attributes, the total number of positive class frequencies is _____

- (a) n^2 (b) n^3
(c) 3^n (d) 2^n

7. The value for c for the probability density function

$$f(x) = \frac{x}{c}, x = 1, 2, 3, 4, 5 \text{ is } \underline{\hspace{2cm}}$$

- (a) $\frac{1}{15}$ (b) 15
(c) $\frac{15}{2}$ (d) 1

8. If X is the number on a die when it is thrown, $E(X) = \underline{\hspace{2cm}}$

- (a) $\frac{1}{6}$ (b) 1
(c) 7 (d) $\frac{7}{2}$

9. If the mean of a Poisson distribution is λ , standard deviation = _____

- (a) λ (b) λ^2
(c) $\sqrt{\lambda}$ (d) $\sqrt{\lambda^2 + \lambda}$

10. In a normal distribution, Q.D = _____ S.D.

- (a) $\frac{4}{5}$ (b) $\frac{2}{3}$
(c) $\frac{3}{2}$ (d) $\frac{5}{4}$

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) In a frequency distribution, Bowley's coefficient of skewness is 0.6, sum of the upper and lower quartiles is 100, median is 38. Find the value of the upper quartile.

Or

(b) Fit a straight line to the following data :

X	1	2	3	4	6	8
Y	2.4	3	3.6	4	5	6

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

Or

(b) From the following table, find the rank correlation coefficient between the height and weight.

Height (in cm)	165	167	166	170	169	172
Weight (in kg)	61	60	63.5	63	61.5	64

13. (a) Is there any inconsistency in the data given below $N = 600$; $(A) = 300$; $(B) = 400$; $(AB) = 50$.

Or

- (b) Show that the relation between Yule's coefficient Q and the coefficient of colligation Y is $Q = \frac{2Y}{1+Y^2}$.

14. (a) If $f(x) = \begin{cases} Ax & \text{for } 0 < x < 5 \\ A(10-x) & \text{for } 5 \leq x < 10, \\ 0 & \text{otherwise} \end{cases}$ is the probability density function of a random variable X , find the value of A .

Or

- (b) If the random variable X has the following probability law $P(X=x) = q^{x-1} \cdot p$, $x = 1, 2, 3, \dots$, find the moment generating function of X .

15. (a) If the mean of a normal distribution is 4 and the variance is 3, find its mode.

Or

- (b) A book of 500 pages contains 500 mistakes. Find the probability that there are atleast four mistakes in a randomly selected page.

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PART C — (5 × 8 = 40 marks)

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

16. (a) Calculate the first three central moments for the following data :

x	3	6	10	15	20	23	24
f	2	5	15	21	16	13	4

Or

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

x	0	1	2	3
y	3	8	25	74

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

x	65	66	67	67	68	69	70	71
y	67	68	65	68	72	72	69	71

Or

- (b) Let x, y be two variables with standard deviations σ_x and σ_y respectively. If

$$u = x + ky, v = x + \left(\frac{\sigma_x}{\sigma_y}\right)y \text{ and } \gamma_{uv} = 0, \text{ find}$$

the value of k .

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18. (a) If $(A) = 50$, $(B) = 60$, $(C) = 80$, $(AB) = 35$, $(AC) = 45$ and $(BC) = 42$, find the greatest and least value of (ABC) .

Or

- (b) Show that for n attributes A_1, A_2, \dots, A_n ,
 $(A_1 A_2 \dots A_n) \geq (A_1) + (A_2) + \dots + (A_n) - (n-1)N$.

19. (a) If x and y are two random variables, determine whether they are independent in the following cases.

(i) $f(x, y) = \begin{cases} 8xy; & 0 < x < 1, 0 < y < x \\ 0 & \text{otherwise} \end{cases}$

(ii) $f(x, y) = \begin{cases} 4xy; & 0 < x < 1, 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$

Or

- (b) State and prove the addition and multiplication theorems of expectation for continuous random variables.

20. (a) If X is a Poisson variate such that $P(X=2) = 9$, $P(X=4) = 90P(X=6)$, find the value of β .

Or

- (b) For a normal distribution, prove that $\mu_{2n} = (2n-1)\sigma^2 \mu_{2n-2}$.