(7 pages) **Reg. No. :.........................................**

**Code No. : 30346 E** **Sub. Code : JAST 11/ SAST 11**

B.Sc.(CBCS) DEGREE EXAMINATION,
NOVEMBER 2020.

First/Third Semester

Statistics – Allied

STATISTICS — I

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. For a symmetric distribution $\beta_1 =$ ——————

(a) 0 (b) 1

(c) 2 (d) 3

2. If $\gamma_2 = 0$ the distribution curve is

(a) Meso kurtic (b) Platy Kurtic

(c) Lepto Kurtic (d) None

3. The formula for finding the correlation coefficient between $x$ and $y$ is

(a) $\frac{\text{cov}(x,y)}{\sigma_x}$ (b) $\frac{\text{cov}(x,y)}{\sigma_y}$

(c) $\frac{\text{cov}(x,y)}{\sigma_x \sigma_y}$ (d) $\frac{\sigma_x \text{cov}(x,y)}{\sigma_y}$

4. The two variables are uncorrelated then the lines of regression are ———— to each other.

(a) Parallel (b) Opposite

(c) Perpendicular (d) Same direction

5. Given $n$ attributes the total number of positive class frequency is

(a) $2^n - 1$ (b) $2^{n-1}$

(c) $2^n$ (d) $2^{n-1} - 1$

6. If $A$ and $B$ are perfectly disassociated then the Yules coefficient of association

(a) +1 (b) –1

(c) 0 (d) ±1

7. If $X$ is a random variable, $a$ and $b$ are constants then $V(aX) =$ ————

(a) $aV(X)$ (b) $a^2V(X)$

(c) $a^3V(X)$ (d) $a^4V(X)$

8. The value of $\phi(0) =$ ————

(a) 0 (b) 1

(c) $\alpha$ (d) $-\alpha$

9. The characteristic function of the Poisson distribution is

(a) $e^{\lambda(e^{it}-1)}$ (b) $e^{\lambda(e^{t}-1)}$

(c) $e^{\lambda e^{t}}$ (d) $e^{\lambda(e^{it}+1)}$

10. In a normal distribution $\mu_4 =$ ————

(a) 3 (b) $3\sigma^4$

(c) $3\sigma^2$ (d) 0

PART B — (5 × 5 = 25 marks)

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

11. (a) Prove that $\mu_r' = \mu_r + rc_1\mu_{r-1}\mu_1' + rc_2\mu_{r-2}(\mu_1')^2 + \cdots + (\mu_1')^r$.

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) Show that $-1 \le r_{xy} \le 1$.

Or

(b) Show that the rank correlation $\rho$ is given by

$$\rho = 1 - \frac{6\Sigma(x-y)^2}{n(n^2-1)}.$$

13. (a) Examine the consistency of the following data. $N = 1000$ $(A) = 600$ $(B) = 500$ $(AB) = 50$.

Or

(b) If Yules coefficient is $Q$ and coefficient of colligation is $Y$ then show that $Q = \frac{2Y}{1+Y^2}$.

14. (a) Prove that the moment generating function of the sum of two independent variables is to product of their moment generating function.

Or

(b) Let $X$ have the probability density function.

$$f(x) = \begin{cases} \frac{x+1}{2}, & -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

Find (i) $E(X)$ (ii) $E(X^2)$.

15. (a) Find the moment generating function about mean of a binomial distribution.

Or

(b) Find the mode of the normal distribution.

PART C — (5 × 8 = 40 marks)

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

16. (a) Calculate the first four moments of the following distribution about the mean Also find $\beta_1$ and $\beta_2$.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $x$ : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $f$ : | 1 | 8 | 28 | 56 | 70 | 56 | 28 | 8 | 1 |

Or

(b) Fit a curve of the form $y = ab^x$ to the following data.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $x$ : | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
| $y$ : | 201 | 263 | 314 | 395 | 427 | 504 | 612 |

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

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $x$ : | 51 | 63 | 63 | 49 | 50 | 60 | 65 | 63 | 46 | 50 |
| $y$ : | 49 | 72 | 75 | 50 | 48 | 60 | 70 | 48 | 60 | 56 |

Or

(b) The two variables $x$ and $y$ have the regression lines $3x+2y-26=0$ and $6x+y-31=0$. Find (i) $\bar{x}, \bar{y}$ (ii) The coefficient of correlation between $x$ and $y$ (iii) $\sigma_y$ when $\sigma_x^2 = 25$.

18. (a) If $A_1, A_2, .....A_n$ are $n$ attributes then prove $(A_1A_2....A_n) \geq (A_1) + (A_2) + \cdots + (A_n) - (n-1)N$.

Or

(b) Given the following ultimate class frequencies find the frequencies of positive class. $(ABC) = 149$ $(AB\gamma) = 738$ $(A\beta C) = 225$ $(A\beta\gamma) = 1196$ $(\alpha BC) = 587$ $(\alpha B\gamma) = 1762$ $(\alpha\beta C) = 171$ $(\alpha\gamma\beta) = 21842$.

19. (a) If $X$ and $Y$ are continuous random variable then

(i) $E(X+Y) = E(X) + E(Y)$

(ii) $E(XY) = E(X).E(Y)$ if $X$ and $Y$ are independent, assuming that all the expectations exist.

Or

(b) A random variable $X$ has the probability function

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $x$ : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| $P(x)$ : | 0 | $k$ | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ | $7k^2+k$ |

(i) find $k$ (ii) evaluate $P(X<6)$ $P(X \geq 6)$ $P(0<X<5)$ (iii) determine the distribution function of $X$.

20. (a) If $X \sim P(\lambda)$ then prove that $\mu_{r+1} = r\lambda\mu_{r-1} + \lambda\frac{d\mu_r}{d\lambda}$.

Or

(b) In a normal distribution 7% of the items are under 35 and 89% of the items are under 63. Find the mean and standard deviation of the distribution.