

B.Sc. (Honours) Examination, 2018

Semester-I

Statistics (Allied)

Course : BSA-11

Descriptive Statistics and Probability Theory

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Answer question No. 1 and **any three** from the rest.

1. Choose the correct alternative(Answer **any five**) 5X2=10
- i) If a fair coin is tossed twice and the number of heads obtained is denoted by the random variable X then find V(X).
- ii) If a random variable X follows Binomial distribution with mean 2 and $E(X^2) = \frac{28}{5}$, then find P(X=1).
- iii) Define the terms: Attribute, Variable.
- iv) What is frequency curve?
- v) Write down two measure of Skewness.
- vi) Show that if the Standard Deviation (SD) of a variable is zero then the variable takes all the same values.
- vii) If the correlation coefficient between two variables be zero, can the variables said to be independent?
- viii) What is the variance of a symmetric binomial distribution with mean 10?
2. (a) Suppose the variable 'x' takes positive values only and $(x_i - \bar{x})$ are small compared to \bar{x} . Then show that $x_g \approx \bar{x} \left(1 - \frac{S^2}{2\bar{x}^2}\right)$ where x_g and S are the geometric mean and standard deviation.
- (b) In usual notations, show that for any frequency distribution $b_2 \geq b_1 + 1$
3. (a) Show that the angle between regression lines is

$$\frac{\pi}{2} - \tan^{-1} \left| \frac{r}{1-r^2} \frac{S_x^2 + S_y^2}{S_x S_y} \right|$$

5

P.T.O.

(2)

(b) Suppose Y_i be the predicted value of y at $x=x_i$, i.e. $Y_i = \bar{y} + r \frac{S_y}{S_x}(x_i - \bar{x})$ and $e_i = y_i - Y_i$. Then show that $\text{cov}(Y, e)=0$. 5

4. (a) State and prove Boole's inequality. 5

(b) Three boxes of the same appearance have the following proportions of black and white balls: Box I- 5 black and 3 white; Box II- 6 black and 2 white; Box III- 3 black and 5 white. One of the boxes is selected at random and one ball is drawn randomly from it.

i) What is the probability that the ball is white?

ii) Given that the ball is white, find the probability that it came from Box I. 5

5. (a) Three balls are drawn at random from a bag containing 5 white and 3 black balls. If X denotes the number of white balls drawn, write down the probability distribution of X . Also find $E(X)$ and $\text{Var}(X)$. 5

(b) A continuous random variable X has a pdf given by 5

$$f(x) = \begin{cases} \frac{1}{2} - ax, & 0 \leq x \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

Where, a is a constant. Find i) a ii) $P(1 < X < 2)$ iii) $E(X)$

6. (a) X and Y are two random variables having joint probability distribution given by 5

		y		
		0	1	2
x	0	0.1	0.1	0.1
	1	0.1	0.2	0.1
	2	0.1	0.1	0.1

Find i) conditional distribution of y given $x=1$

ii) $P(x + y \geq 3)$

iii) $P(x < y)$

b) Find the mean and standard deviation of a continuous random variable X with pdf 5

$$f(x) = \begin{cases} \frac{4x}{5}, & 0 < x \leq 1 \\ \frac{2}{5}(3-x), & 1 < x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$
