

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
BSc DEGREE EXAMINATION DECEMBER 2019  
(Third Semester)

Branch - MATHEMATICS

MATHEMATICAL STATISTICS - I

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 1 = 10)

- 1 The total number of possible outcomes in any trial is known as  
(i) space (ii) favourable events  
(iii) probability space (iv) exhaustive events
- 2 If  $A \subset B$ , the probability  $P(A/B)$  is equal to  
(i) zero (ii) one (iii)  $P(A)/P(B)$  (iv)  $P(B)/P(A)$
- 3 Two random variables X and Y are said to be independent if  
(i)  $E(XY)=1$  (ii)  $E(XY)=0$   
(iii)  $E(XY)=E(X)E(Y)$  (iv)  $E(XY)=$  a constant
- 4 If X is a random variable with mean  $\bar{X}$ , the expression  $E(X - \bar{X})^2$  represents  
(i) mean of x (ii) central moment  
(iii) variance (iv) central moment of order zero
- 5 If X is a random variable, then  $E(e^{tx})$  is known as  
(i) moment generating function (ii) characteristic uncton  
(iii) probability generating function (iv) cumulant generating function
- 6 The marginal probability mass function of 'x' alone is  
(i)  $P_i$  (ii)  $P \cdot i$  (iii)  $P \cdot j$  (iv)  $P_j$
- 7 A family of parametric distribution in which mean is equal to variance is  
(i) binomial distribution (ii) gamma distribution  
(iii) normal distribution (iv) poisson distribution
- 8 If  $X \sim N(M, \sigma^2)$ , the point of inflexion of normal distribution curve are  
(i)  $\pm\mu$  (ii)  $\mu \pm \sigma$  (iii)  $\sigma \pm \mu$  (iv)  $\pm\sigma$
- 9 The relation between the mean and variance of  $\chi^2$  with n.d.f is  
(i) mean=2 variance (ii) 2mean=variance  
(iii) mean=variance (iv) none of the above
- 10 The range of simple correlation co-efficient is  
(i) 0 to  $\infty$  (ii)  $-\infty$  to  $\infty$  (iii) 0 to 1 (iv) -1 to 1

SECTION - B (35 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 7 = 35)

- 11 a (i) What is the chance that a leap year selected at random will contain 53 Sundays? (4 marks)  
(ii) A bag contains 3 red, 6 white and 7 blue balls. What is the probability that two balls drawn are white and blue? (3 marks)
- OR
- b If A and B are two events and are disjoint, then prove that  
(i)  $P(\bar{A}) = 1 - P(A)$  (3 marks)  
(ii)  $P(A \cup B) = P(A) + P(B)$   $P(A \cap B) = 0$



- 12 a The diameter of an electric cable, say  $X$  is assumed to be a continuous random variable with p.d.f,  $f(x)=6x(1-x)$ ;  $0 \leq x \leq 1$ . Determine a number 'b' such that  $P(x < b) = P(x > b)$ .
- OR
- b Explain continuous density function with suitable illustration.
- 13 a Let the random variable 'X' assume the value 'r' with the probability law  $p(x=r)=q^{r-1}p$ ;  $r=1,2,3...$  Find the moment generating function of  $X$  and its mean and variance.
- OR
- b Explain in detail about continuous distribution functions.
- 14 a Derive the recurrence relationship for poisson distribution.
- OR
- b  $X$  is a normal variate with mean 30 and S.D.5. Find the probabilities that
- (i)  $26 \leq x \leq 40$  (3 marks)
- (ii)  $x \geq 45$  (4 marks)
- 15 a Describe briefly about student's t distribution.
- OR
- b Mention properties of correlation and regression with suitable illustrations.

**SECTION - C (30 Marks)**

Answer any **THREE** Questions

**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 State and prove Baye's theorem.
- 17 An experiment consist of three independent tosses of a fair coin. Let  $x$ =the number of heads;  $Y$ =the number of head runs,  $z$ =the length of head runs, a head runs being defined as constructive occurrence of atleast 2 heads, its length then being the number of head occurring together in three tosses of the coin. Find the probability function of  $X$  and  $Y$ .
- 18 The joint probability density function of a two dimensional random variable  $(X,Y)$  is given by  $f(X,Y)=2$ ;  $0 < x < 1$ ;  $0 < y < x=0$ ; otherwise.
- (i) Find marginal density function of  $X$  and  $Y$ .
- (ii) Find conditional density function of  $Y/X = x$  &  $X/Y = y$ .
- 19 Derive mean and variance of Normal distribution.
- 20 Calculate correlation co-efficient for the following data:

X:	65	66	67	67	68	69	70
Y:	67	68	65	68	72	72	69

Z-Z-Z

END