PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2019
(Second Semester)

Branch – **STATISTICS**

PROBABILITY & DISTRIBUTIONS - I

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1 If ACB then
(i) $P(A) \leq P(B)$ (ii) $P(A) = P(B)$
(iii) $P(A) \neq P(B)$ (iv) $P(A) \geq B$

2 An integer is chosen at random out of the integers from 1 to 100. What is the probability that it is greater than 70?
(i) $\frac{35}{100}$ (ii) $\frac{30}{100}$
(iii) $\frac{32}{100}$ (iv) $\frac{38}{100}$

3 If a random variable x denotes the number of heads obtained in the two tosses. Then the range space of x is
(i) {0} (ii) {0, 1}
(iii) {2} (iv) {0, 1, 2}

4 If c is a constant then E(c) is
(i) C^2 (ii) C^3
(iii) C^4 (iv) C

5 The distribution function of the two-dimensional random variable (x, y) is a real valued function I defined for all real x and y by the relation
(i) F(x, y) = P [X=x, Y=u] (ii) F(x, y) = P(x)
(iii) F(x, y) = P(y) (iv) $F(x, y) = P(X \leq x, Y \leq y)$

6 If F is a distribution function of a two-dimensional random variable then $F(-\infty, +\infty)$ is equal to
(i) -1 (ii) +1
(iii) $-\infty$ (iv) $+\infty$

7 $M_{cx}(t)$ is equal to _____ where 'c' is a constant
(i) $M_x(t)$ (ii) $M_c(xt)$
(iii) $M_x(ct)$ (iv) $M_t(x)$

8 Cumulants generating function k(t) is defined as
(i) $M_x(t)$ (ii) $M_t(x)$
(iii) $\log M_t(x)$ (iv) $\log M_x(t)$

9 If the random variables u and v be transformed to the random variables x and y, then the Jacobian of the transformation is defined as
(i) $J = \frac{\partial(x, y)}{\partial(u, v)}$ (ii) $J = \frac{\partial x}{\partial u}$
(iii) $J = \frac{\partial y}{\partial u}$ (iv) $J = \frac{\partial^2(x, y)}{\partial^2(u, v)}$

Cont...

10 If the cumulative distribution function of a contentious random variable X is F(x), then the cumulative distribution function of $y = x + a$ is

(i) $F(x + a)$ (ii) $F(x - a)$

(iii) $F(x)$ (iv) $aF(x)$

SECTION - B (25 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a State and prove multiplication theorem on probability.

OR

b Define (i) Classical (ii) Statistical and (iii) Axiomatic probability.

12 a A random variable x has the following probability function

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

Find (i) k (ii) $p(x < 3)$.

OR

b i) Define distribution function (ii) State its properties (iii) Prove any one of the properties of the distribution function.

13 a Write short notes on Bi-variate distributions.

OR

b Test whether x and y are independent variables given that $f(x, y) = \begin{cases} 4xy & 0 < x < 1, 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$

14 a Prove that sum of two independent random variables is equal to the product of their characteristic functions.

OR

b Write short notes on convergence in probability.

15 a Let (x, y) be a two dimensional continuous random variable with $f(x, y) = 8xy$, $0 < y < x < 1$. Find E[y/x].

OR

b If x and y are independent, prove that E[y/x] = E[y].

SECTION -C (40 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a State and prove Baye's theorem.

OR

b Three urms of the same appearance have the following proportion of balls. First urn: 2 black, 1 white; Second urn; 1 black, 2 white; Third urn : 2 black 2 white. One of the urns is selected and one ball is drawn. It turns out to be white what is the probability of drawing a white ball again, the first one not having been returned?

17 a A coin is lossed unit a head appears. What is the expectation of the number of losses?

OR

b Given the following bivariate probability distribution. Obtain (i) Marginal distribution (ii) Conditional distribution of x when y = 2.

↓y / x→	-1	0	1
0	1/15	2/15	1/15
1	3/15	2/15	1/15
2	2/15	1/15	2/15

18 a State and prove Tc hebycher's inequality.

OR

b State and prove Bernalli's weak law of large numbers.

19 a For the joint distribution

$$f(x, y) = \begin{cases} \frac{9}{4} - x - y & 0 \le x \le 2, 0 \le y \le 2 \\ 0 & \text{elsewhere} \end{cases}$$

obtain the marginal and conditional distribution of x given y.

OR

b Given the joint p.d.f. of (x,y) as $f(x, y) = \begin{cases} \frac{k}{(1+x+y)^3} & x > 0, y > 0 \\ 0 & \text{elsewhere} \end{cases}$

Find (i) k (ii) marginal density of x.

20 a Explain in detail conditional expectation and conditional variance with an example.

OR

b Discuss in detail on transformation of random variables.

Z-Z-Z END