

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)BSc DEGREE EXAMINATION MAY 2019
(Sixth Semester)

Branch – MATHEMATICS WITH COMPUTER APPLICATIONS

CORE ELECTIVE – II MATHEMATICAL STATISTICS

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 What is mutually exclusive events?
- 2 Define independent events.
- 3 What is continuous random variable?
- 4 A continuous random variable X follows the probability law $f(x) = Ax^2$, $0 \leq x \leq 1$, determine the value of 'A'.
- 5 If $X \geq 0$, then prove that $E(X) > 0$.
- 6 The p.d.f of the density $f(x) = \begin{cases} \frac{2}{x^3}; x \geq 1 & \text{then find } E(X) \\ 0 & \text{otherwise} \end{cases}$
- 7 Give the physical condition for binomial distribution.
- 8 Define Poisson distribution.
- 9 Write any two applications of 't' distribution.
- 10 Define F statistic.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a For any three events A, B and C then prove that
$$P\left[\frac{A \cup B}{C}\right] = P\left[\frac{A}{C}\right] + P\left[\frac{B}{C}\right] - P\left[\frac{A \cap B}{C}\right].$$

OR

b A card is drawn from a well – shuffled pack of playing cards. What is the probability that it is either a spade or an ace?
- 12 a The diameter of an electric cable, say X, is assumed to be a continuous random variable with p.d.f $f(x) = 6x(1-x)$, $0 \leq x \leq 1$. (i) Check the above is p.d.f (ii) Determine a number b such that $P(X < b) = P(X > b)$.

OR

b A probability curve $y = f(x)$ has a range from 0 to ∞ , $f(x) = e^{-x}$, find the mean and variance.
- 13 a State and prove multiplication theorem of mathematical expectation.

OR

b Let X and Y be two random variable such that $Y \leq X$ then $E(Y) \leq E(X)$, provided that expectations exist.
- 14 a The mean and variance of the binomial distribution are 4 and $4/3$. Find $P(X \geq 1)$.

OR

b Derive the moment generating function of Poisson distribution.

Cont ...

15. a State the assumptions for student's t-test.

OR

b Derive the mode of the F distribution.

SECTION - C (30 Marks)

Answer any **THREE** Questions

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

16 The contents of urns I, II and III are as follows:

1 white, 2 black and 3 red balls,

2 white, 1 black and 1 red balls, and

4 white, 5 black and 3 red balls

One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from I, II and III?

17 For the following density function $f(x) = cx^2(1-x)$, $0 < x < 1$ calculate (i) c (ii) Mean.

18 Let X be a random variable with the following probability function

x :	-3	6	9
P(X = x) :	1/6	1/2	1/3

Find $E(X)$ and $E(X^2)$ and $E(2X + 1)^2$.

19 Obtain the mean and variance of Poisson distribution.

20 Derive Constants of 't' distribution.

Z-Z-Z

END