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(Printed Pages 7)

Roll No. \_\_\_\_\_

**19/1220**

**बी.ए./बी.एस-सी. (भाग-I) परीक्षा, 2019**

**B.A./B.Sc. (Part-I) Examination, 2019**

**STATISTICS**

**प्रथम प्रश्न-पत्र**

**First Paper**

**(Probability)**

**Time : Three Hours**

**Maximum Marks : 50**

**Note:** Answer **five** questions in all. Question **No.1** is **compulsory**. Answer **one** question from each unit. **All** questions carry equal marks. The answers to short answer type questions should not exceed **200** words and the answers to long answer type questions should not exceed **500** words.

1. (a) What is meant by random experiment?  
1×10=10

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- (b) What are the limitations of the classical definition of Probability?
- (c) Write down the properties of probability density and probability distribution functions.
- (d) Write down the multiplicative theorem of Probability for two events.
- (e) A continuous random variable has the probability density function as.

$$f(x) = \begin{cases} \lambda (1 + x^2) & ; 1 \leq x \leq 5 \\ 0 & ; \text{otherwise} \end{cases}$$

Find the value of  $\lambda$ .

- (f) Show that the distribution function  $F(x)$  of a random variable  $X$  is a non-decreasing function of  $x$ .
- (g) Let  $X$  and  $Y$  be two independent random variables with  $\text{var}(x)=9$  and  $\text{var}(y)=3$ . Find  $\text{var}(4x-2y+6)$ .

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(h) It X and Y are two independent random variables, then prove that.

$$E[xy]=E[x] E[y].$$

(i) Write down the uniqueness theorem of moment generating function.

(j) Write an application of the weak law of large numbers.

**UNIT-I**

2. State and prove the addition theorem of probability for two events A and B. A problem of statistics is given to two students A and B whose chances of solving it to are 1/4 and 3/4 respectively. What is the probability that the problem will be solved if they try independently. 10

**OR**

3. State and prove Bayes theorem. The first of three urns contains 7 white and 10 black

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balls, the second contains 5 white and 12 black balls and third contains 17 white (and no black ball). A person chooses an urn at random and draws a ball from it. The ball is white. Find the probability that ball came from second urn. 10

**UNIT-II**

4. Define probability mass function of a random variable. The probability mass function of a random variable x is given is the following table. 10

x	:	-2	-1	0	1	2	3
p(x)	:	0.1	K	0.2	2K	3	K

Find

(i) the value of K

(ii)  $P(x < 1)$

(iii)  $P(-1 < x \leq 2)$

4

**OR**

5. Find the constant k such that

$$f(x, y) = \begin{cases} K(x + 1) e^{-y} & ; \quad 0 < x < 1 \\ & y > 0 \\ 0 & ; \text{ otherwise} \end{cases}$$

is a joint probability density function of the continuous random variables X and Y. Are X and Y independent random variables? Explain.

10

**UNIT-III**

6. Define the mathematical expectation of a random variable. If a random variable x has the density function.

10

$$f(x) = \begin{cases} e^{-x} & ; \quad x > 0 \\ 0 & ; \text{ otherwise} \end{cases}$$

then find

(i)  $E \left[ e^{\frac{2x}{3}} \right]$

(ii)  $E [2x^2]$

**OR**

7. Let the two dimensional random variable (x,y) have the joint density function.

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y) & ; \quad 0 < x < 2 \\ & 2 < y < 4 \\ 0 & ; \text{ otherwise} \end{cases}$$

Find :

10

(i)  $E[y/x]$

(ii)  $E[y^2/x]$ .

**UNIT-IV**

8. Define the moment generating function. Find the moment generating function of the variate x with density function.

$$f(x) = \begin{cases} ae^{-ax} & ; \quad a, x > 0 \\ 0 & ; \text{ otherwise} \end{cases}$$

and hence obtain mean and variance of x.

**OR**

9. State and prove chebyshev's inequality. If a random variable  $x$  has mean 3 and variance 2, then obtain an upper bound for  $x$  when.

(i)  $P[|x - 3| \geq 2]$

(ii)  $P[|x - 3| \geq 1]$  10

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