

roll No. ....

**C****CBE-825-T****2**

**CBE-825-T**  
**B. A. / B. Sc. / B.Sc. B.Ed.**  
**Fifth Semester (End semester)**  
**Examination Dec. 2018**

**MATHEMATICS**

**Paper : MTS-SE-511**  
**(Probability & Statistics)**

**Time : Three Hours ] [ Maximum Marks :60**

**Note :- All questions are compulsory.**

**SECTION - A**  
**(Objective Type Questions)     $1 \times 10 = 10$**

**Note :- Choose the correct answer.**

. (1) Let  $X$  have the discontinuous cdf

$$F_X(x) = \begin{cases} 0 & x < 0 \\ \frac{x}{2} & 0 \leq x < 1 \\ 1 & 1 \leq x \end{cases}$$

[ P. T. O.

then  $P\left(-1 < X < \frac{1}{2}\right)$  is—

- (a) 0
- (b)  $\frac{1}{4}$
- (c) 1
- (d)  $\frac{1}{2}$

(2) Let the random variable  $X$  of a discrete type have the pmf given by the table—

$x$	1	2	3	4
$p(x)$	$\frac{4}{10}$	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{2}{10}$

$E(x)$  is :

- (a) 1.3
- (b) 2.3
- (c) 3.3
- (d) 4.3

(c)  $M_x(t) = \sum_x x \cdot \frac{6}{\pi^2 x^2}$

(d) None of these

(5) The characteristic function is given by—

(a)  $\phi_x(t) = E(e^{tx})$

(b)  $\phi_x(t) = E(e^{t/x})$

(c)  $\phi_x(t) = E(e^x)$

(d) None of these

(6) Joint probability density functions is represented by—

(a)  $f(x)$

(b)  $f(xy)$

(c)  $f(x)$

(d) None of the above

(7) Independent random variables will be, if :

(a)  $f(xy) = f(x) \cdot f(y)$

(b)  $f(xy) = f(x) + f(y)$

(c)  $f(xy) = f(x) - f(y)$

(d) None of these

(8) Probability space in tossing of a coin in  $x$  liner will be—

(a)  $2^x$

(b)  $2^x + 1$

(c)  $2^x + 2$

(d) None of these

(9) If  $X \sim B(x, p)$ , then  $E(x)$  is—

(a)  $xp$

(b)  $xpq$

(c)  $xp+1$

(d)  $xq+1$

(10) If  $X \sim p(\lambda)$  then  $V(X)$  is—

(a)  $V(X) = xp$

(b)  $V(X) = xpq$

- (c)  $v(X)=\lambda$   
 (d)  $v(x)=\lambda+1$

**SECTION - B**(Short Answer Type Questions)  $4 \times 5 = 20$ 

**Note :-** Attempt any four questions. Each question carries five marks.

2. Explain basic properties of  $\langle \Omega, F, P \rangle$
3. Define real random variables, and classify it giving examples.
4. Define mathematical expectation. Evaluate expectation of a uniform random variable.
5. Verify that

$$f(x, y) = \frac{1}{y} e^{-\left(y + \frac{x}{y}\right)}, \quad 0 < x < \infty, \quad 0 < y < \infty$$

is a joint density function.

6. Explain conditional expectations with examples.

7. Define Poisson random variable with parameters  $\lambda$

for some  $\lambda > 0$  show that  $\sum_{i=0}^{\infty} p(i) = 1$

**SECTION - C**(Long Answer Type Questions)  $3 \times 10 = 30$ 

**Note :-** Attempt any three questions. Each question carries ten marks.

8. Explain a sample space associated with a random experiment. Define  $\sigma$  field. Define a probability measure.
9. Consider a sample space  $\Omega = \{1, 2, 3, 4, \dots, 6\}$  construct all  $\sigma$  fields of the above sample space.
10. Suppose we select a point at random in the interior of a circle of radius 1. Let  $X$  be the distance selected from the origin. Construct the sample space  $\Omega$  for this experiment. Write the probability  $P(C)$  of the selected point lying in a set  $C$  interior to the sample space  $\Omega$ . Write  $P[X \leq x]$  i.e. the probability of the point lying in a circle of radius  $x$ . Evaluate the cdf of  $X$ , and also evaluate pdf of  $X$ . Calculate

$$P\left(\frac{1}{4} < X < \frac{1}{2}\right)$$

**[P.T.O.]**

**11. Define moment generating function of a random**

**variable. Let  $X$  have the  $mgf M(t) = e^{t^2/2}$ ,  $-\infty < t < \infty$**

**Evaluate  $E(X)$ ,  $E(X^2)$ ,  $E(X^3)$  and  $E(X^n)$ .**

**12. If a distribution does not have moment generating function, then which concept is helpful to characterise the distribution uniquely ? Define it, with example.**