

**B A, B SC, B COM DEGREE END SEMESTER EXAMINATION - APRIL 2025****UGP (HONS.) SEMESTER - 2: DISCIPLINE SPECIFIC COURSE****COURSE: 24USTADSC102/ 24UEMSDSC106: THEORY OF RANDOM VARIABLES AND STATISTICAL DISTRIBUTION***(For Regular 2024 Admission)*

Time: 2 Hours

Max. Marks: 70

*(Use of Scientific Calculator and Statistical Tables are permitted)***PART A****(Maximum mark from this part is 10. Each question carries 2 marks.)**

1. Define a random variable. Which are the different types of random variables? (CO1, U)
2. Define independence of two random variables X and Y. (CO1,R)
3. Write Cauchy- Schwartz's inequality. (CO2, R)
4. Write down the properties of moment generating function. (CO2, R)
5. For a binomial distribution, the mean and variance are 16 and 8. Find  $P(X=0)$ . (CO3, A)
6. Write the characteristic function of the binomial distribution. (CO2,U)
7. Write the pdf of the Bernoulli distribution. Also, write its mean and variance. (CO3, U)
8. What is the m.g.f of the normal distribution? (CO4, R)

**PART B****(Maximum mark from this part is 30. Each question carries 5 marks.)**

9. A random variable X has the following probability function. Determine the value of  
(i) k (ii) find  $P(X < 2)$

x	0	1	2
P(x)	k	2k	3k

(CO1, A)

10. Define (i) joint pdf of the random variable pair (X,Y).  
(ii) Marginal distributions of X and Y. (CO1, A)
11. Define expectation of a random variable. Write down its properties. (CO2,R)
12. Three unbiased coins are tossed. Find the expected value of the number of heads obtained. (CO2,A)
13. The average percentage of failure in a certain examination is 40%.  
What is the probability that out of a group of 6 candidates,  
i) at least 4 passes the examination ii) Number of passes is between 2 and 4. (CO3, A)
14. Derive the mean and variance of the Poisson distribution. (CO3, R)
15. Write any five properties of normal distribution. (CO4, R)
16. A normal variate X has mean 20 and standard deviation 5.  
Find the (i)  $P(X > 20)$  (ii)  $P(20 < X < 30)$  (CO4,A)

## PART C

(Maximum mark from this part is 30. Each question carries 15 marks.)

17. Let X and Y be a pair of discrete random variables each taking values

1, 2, 3 with the following joint distribution.

(i) Find the marginal distributions of X and Y.

(ii) Examine whether X and Y are independent.

(CO1, A)

X \ Y	Y	1	2	3
	X			
1		$\frac{5}{27}$	$\frac{3}{27}$	$\frac{3}{27}$
2		$\frac{1}{27}$	$\frac{3}{27}$	$\frac{3}{27}$
3		$\frac{2}{27}$	$\frac{5}{27}$	$\frac{2}{27}$

18. Let X and Y have the joint pdf  $f(x,y) = \frac{x+2y}{18}$ ,  $x = 1,2$  and  $y = 1,2$ .

Find the Distribution function  $F(X,Y)$ ?

(CO1, A)

19. Fit a Poisson distribution to the following data and calculate the theoretical frequencies.

(CO3, A)

Deaths (x)	0	1	2	3	4
Frequency (f)	122	60	15	2	1

20. The scores in a test follow normal distribution with mean 60 and standard deviation 10.

Find the percentage of students scoring (i) above 75 marks (ii) between 65 and 75

(iii) below 40 marks.

(CO4, A)