

BA, BSc, BCOM DEGREE END SEMESTER EXAMINATION - APRIL 2026**UGP (HONS.) SEMESTER - 2 : DISCIPLINE SPECIFIC COURSE****COURSE CODE: 24USTADSC102/24UEMSDSC106 – THEORY OF RANDOM VARIABLES AND STATISTICAL DISTRIBUTIONS***(For Regular 2025 Admission and Improvement/Supplementary 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 pdf of a random variable. Write down its properties. (CO1,R)
2. Distinguish between discrete and continuous random variables. (CO1,U)
3. Define arithmetic mean and variance of a random variable in terms of expectation. (CO2,U)
4. Define characteristic function of a random variable. List any two properties of it. (CO2, R)
5. Obtain the pdf of the Random variable when the m.g.f. is $(0.4 + 0.6e^t)^8$.
Also find $P(X=0)$. (CO3, A)
6. Define geometric distribution. (CO3, R)
7. Define Standard normal distribution? (CO4, R)
8. Write the p.d.f. of the normal distribution? (CO4,U)

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 $P(X<3)$

x	0	1	2	3	4	5	6	7	8
P(x)	k	3k	5k	7k	9k	11k	13k	15k	17k

- (CO1,A)
10. Define (i) distribution function of a random variable. (ii) Write down its properties. (CO1,R)
 11. Define m.g.f of a random variable. Write down its properties. (CO2,R)

12. A balanced die is rolled. If a person receives Rs.10/- when he scores even number of points and loses Rs. 8/- when he scores odd number of points, how much money can he expect on the average in the long run? (CO2, A)
13. A Poisson variate X is such that $P(X=1) = 2 P(X= 2)$. Find $P(X = 0)$. (CO3,A)
14. Derive the mean of Binomial distribution. (CO3, U)
15. Write any five properties of normal distribution. (CO4,R)
16. A normal variate X has the m.g.f $e^{40t + \frac{25t^2}{2}}$. Find $P(X > 45)$ (CO4,A)

PART C

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

17. Let X and Y have the joint pdf $f(x,y) = k(3x + 4y)$, $x = 1,2, 3$ and $y = 0,1,2$.
- (i) Find the value of k. (ii) Find the marginal distributions of X and Y.
- (iii) Examine whether X and Y are independent (CO1, A)
18. Let (X,Y) be a pair of discrete random variables each taking values 0, 1, 2 with the following joint distribution. Find the Distribution function of (X,Y)? (CO1, A)

Y	0	1	2
X			
0	0.01	0.01	0.02
1	0.22	0.10	0.43
2	0.07	0.08	0.06

19. Fit a binomial distribution to the following data and calculate the theoretical frequencies. (CO3, A)

Variate (x)	0	1	2	3	4
Frequency (f)	4	30	36	25	5

20. A fair coin is tossed 400 times and X denote the number heads obtained. Find (i) $P(X < 220)$
(ii) $P(185 < X < 220)$ (iii) $P(X > 300)$ (CO4, A)