

S.No.

Part – B (Each question carries 8 marks)

1 If the RV X takes the values 1, 2, 3 & 4 such that $2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$, find the Probability Distribution Function and Cumulative Distribution Function of X . Also find $P(X \leq 2)$ and $P(X > 2)$

2 The Probability Distribution Function of a Random Variable X is given below:

x	1	2	3	4
$p(x)$	$4k$	k	$2k$	$3k$

Find (i) k (ii) $P\left(\frac{1}{2} < X < 5 / X > 1\right)$ (iii) $P(X \leq 3)$ (iv) $P(1 \leq X < 2)$

3 The probability mass function of a **discrete** RV X is given by $p(x) = \begin{cases} \frac{1}{4} & \text{for } x = -2 \\ \frac{1}{4} & \text{for } x = 0 \\ \frac{1}{2} & \text{for } x = 5 \\ 0, & \text{otherwise} \end{cases}$
Find (i) $P(|X| \geq 2)$ (ii) $P(0 \leq X \leq 10)$ (iii) $P(X \leq 0)$ (iv) Cumulative Distribution Function

4 The CDF of a **discrete** RV X is given by $F(x) = \begin{cases} 0, & x < 0 \\ \frac{1}{4}, & 0 \leq x < 1 \\ \frac{3}{4}, & 1 \leq x < 2 \\ 1, & x \geq 2 \end{cases}$ Find (i) the Probability Distribution Function of X (ii) $P(0 < X < 2)$ (iii) $P\left(\frac{1}{2} < X < 2 / X \geq 1\right)$ (iv) $P(X \leq 1)$

5 The PDF of a continuous RV X is given by $f(x) = \begin{cases} kx, & 0 \leq x < 5 \\ k(10 - x), & 5 \leq x < 10 \\ 0, & \text{otherwise} \end{cases}$
Find (i) k (ii) $P(X \leq 6 / X > 5)$ (iii) $P(X \leq 6)$

6 If the CDF of a Random Variable X is $F(x) = \begin{cases} 0, & x \leq 0 \\ 2x^2 - x^3, & 0 < x < 1 \\ 1, & x \geq 1 \end{cases}$ find (i) the PDF of X (ii) $P\left(\frac{1}{2} < X < \frac{2}{3}\right)$ using both PDF and CDF

Part – C (Each question carries 15 marks)

7 The Probability Mass Function of a Random Variable X is given below:

x	0	1	2
$p(x)$	$3C^3$	$4C - 10C^2$	$5C - 1$

Find (i) the value of C (ii) CDF (iii) the largest value of x such that $F(x) < \frac{1}{2}$ (iv) the smallest value of x such that $F(x) \geq \frac{1}{3}$ (v) $P(X < 2)$ (vi) $P(0 \leq X \leq 1 / X \geq 1)$ (vii) $P(|X| \leq 2)$

8 A random variable X has the following PDF, $f(x) = \begin{cases} 0, & x < 1 \\ k(x - 1), & 1 \leq x \leq 2 \\ k(3 - x), & 2 \leq x \leq 3 \\ 0, & x > 3 \end{cases}$ where $k > 0$
Find (i) the value of k (ii) CDF of X (iii) $P\left(1 < X < \frac{5}{2}\right)$ (iv) $P(|X| < 2)$