SRM Institute of Science and Technology

Faculty of Engineering and Technology

DEPARTMENT OF MATHEMATICS

21MAB204T-Probability & Queuing Theory - Assignment I

1. A random variable X has the following probability function

x	0	1	2	3	4
$p(x)$	K	$3K$	$5K$	$7K$	$9K$

a) Find the value of K b) Find P(x<3)

2. A random variable X has the following probability distribution

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

Find the value of 'a', $P(X < 5)$, $P(X \geq 3)$, $P(0 < X < 5)$ also the distribution function of X.

3. A random variable X has the following probability function

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find (i) the value of k (ii) $p(1.5 < X < 4.5 \mid X > 2)$ iii) the smallest value of λ such that $p(X \leq \lambda) > \frac{1}{2}$

(iv) the distribution function of X.

4. If X has the probability density function $f(x) = k e^{-3x}$, $x > 0$ Find (i) k (ii) $P(0.5 \leq X \leq 1)$ (iii) Mean of X.

5. A R.V has the PDF $f(x) = \begin{cases} kx & 0 \leq x \leq 2 \\ 2k & 2 \leq x \leq 4 \\ 6k - kx & 4 \leq x \leq 6 \\ 0 & elsewhere \end{cases}$ find 'k' and cdf F(x)

6. The CDF of a random variable X is $F(X) = 1 - (1 + x)e^{-x}, x > 0$. Find the pdf of X, P(1<X<3).

7. A continuous random variable has pdf $f(x) = kx^2 e^{-x}, x > 0$. Find the mean and variance.

8. If the MGF of a continuous R.V X is given by $M_X(t) = \frac{3}{3-t}$. Find the first four moments of X.

9. Find the MGF of ar.v X whose p.d.f. defined by $f(x) = \begin{cases} x, \ for\ 0 \leq x \leq 1 \\ 2 - x, for 1 \leq x \leq 2 \\ 0, \quad otherwise \end{cases}$ Hence find mean and variance of X.

10. If the density function of a continuous random variable X is given by $f(x) = \begin{cases} ax, 0 \leq x \leq 1 \\ a, 1 \leq x \leq 2 \\ 3a - ax, 2 \leq x \leq 3 \end{cases}$

Find the value of 'a' and CDF of X

11. If the pdf of X is $f_X(x) = 2x, 0 < x < 1$, then find the pdf of Y = 3 x + 1.

12. A random variable x has probability function, $f(x) = \frac{1}{2^x}, x = 1,2,3$ .... Find MGF and the first four moments of X.

13. Find the moment generating function for the distribution whose p.d.f is $f(x) = \lambda e^{-\lambda x}$, $x > 0$ and hence find its mean and variance.

14. A random variable X has density function $f(x) = \begin{cases} \frac{K}{1+x^2}, -\infty < x < \infty \\ 0 \quad , \ Otherwise \end{cases}$. Determine K and the distribution function. Evaluate the probability $P(x \geq 0)$.

15. A fair die is tossed 720 times. Use Chebyshev's inequality to find a lower bound for the probability of getting 100 to 140 sixes.

16. A random variable X has a mean $\mu = 12$ and variance $\sigma^2 = 9$ and an unknown probability distribution. Find P(6<X<8).