



12th Science- : Maths  
Probability Distributions

DATE:

TIME: 1 Hours

MARKS: 25

SEAT NO:

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**Note:-**

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

**Section A**

**Q.1 Select and write the correct answer.**

**(4)**

1. If the p.d.f of a.c.r.v.  $X$  is  $f(x) = \frac{x^2}{18}$  for  $-3 < x < 3$  and then  $P(|X| < 1) =$   
 $= 0$  otherwise

- A)  $\frac{1}{27}$       B)  $\frac{1}{28}$   
C)  $\frac{1}{29}$       D)  $\frac{1}{26}$

2. The probability distribution of a discrete r.v.  $X$  is, What will be the value when  $P(x \leq 4)$

$X = x$	1	2	3	4	5	6
$P(X = x)$	$k$	$2k$	$3k$	$4k$	$5k$	$6k$

- A)  $\frac{21}{10}$       B)  $\frac{1}{21}$   
C)  $\frac{10}{21}$       D)  $\frac{1}{10}$

**Q.2 Answer the following.**

**(3)**

1. The following is the p.d.f. of continuous r.v.  $f(x) = \frac{x}{8}$ , for  $0 < x < 4$  and  $= 0$  otherwise.  
(i) Find expression for c.d.f. of  $X$   
(ii) Find  $F(x)$  at  $x = 0.5, 1.7$  and  $5$
2. The person on the high protein diet is interested gain of weight in a week. Identify the random variable as either discrete or continuous . Write down the range of it.
3. Two dice are thrown simultaneously. If  $X$  denotes the number of sixes, find the expectation of  $X$ .

**Section B**

**Attempt any Four**

- Q.3 The following is the p.d.f. of r.v.  $X : f(x) = \frac{x}{8}$ , for  $0 < x < 4$  and  $= 0$  otherwise. Find  $P(x < 1.5)$  **(2)**

- Q.4 The probability distribution of discrete r.v.  $X$  is follows. (i) Determine the value of  $k$ . (ii) Find  $P(X \leq 4), P(2 < X < 4), P(X \geq 3)$  **(2)**

$X = x$	1	2	3	4	5	6
$P(X = x)$	$k$	$2k$	$3k$	$4k$	$5k$	$6k$

Q.5 Find expected value and variance of  $X$ , where  $X$  is number obtained on uppermost face when a fair die is thrown. (2)

Q.6 It is known that error in measurement of reaction temperature (in  $0^\circ\text{C}$ ) in a certain experiment is continuous r.v. given by (2)

$$f(x) = \begin{cases} \frac{x^2}{3}, & \text{For } -1 < x < 2 \\ 0 & \text{Otherwise} \end{cases}$$

(i) Verify whether  $f(x)$  is p.d.f. of r.v.  $X$ .

Q.7 Verify  $f(x) = \sin x$ , for  $0 \leq x \leq \frac{\pi}{2}$  is p.d.f. of r.v.  $X$ . (2)

Q.8 A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails. (2)

**Section C**  
**Attempt any Two**

Q.9 Suppose error involved in making a certain measurement is continuous r.v.  $X$  with p.d.f.  $f(x) = k(4 - x^2)$ , for  $-2 \leq x \leq 2$  and  $= 0$  otherwise. Find  $P(-1 < x < 1)$  (3)

Q.10 A player tosses two coins he wins ₹ 10 if 2 heads appears, ₹ 5 if 1 head appears and ₹ 2 if no head appears. Find the expected winning amount and variance of winning amount. (3)

Q.11 Given the p.d.f. of a continuous r.v.  $X$ ,  $f(x) = \frac{x^2}{3}$ , for  $-1 < x < 2$  and  $= 0$  otherwise (3)  
Determine c.d.f. of  $X$  hence find  $P(x < 1)$ ,  $P(x < -2)$ ,  $P(X > 0)$ ,  $P(1 < x < 2)$

**Section D**  
**Attempt any One**

Q.12 In the p.m.f. of r.v.  $X$ . Find  $a$  and obtain c.d.f. of  $X$ . (4)

$x$	1	2	3	4	5
$P(X)$	$\frac{1}{20}$	$\frac{3}{20}$	$a$	$2a$	$\frac{1}{20}$

Q.13 Find the probability distribution of (i) Number of heads in two tosses of a coin. (ii) Number of tails in the simultaneous tosses of three coins. (iii) Number of heads in four tosses of a coin. (4)