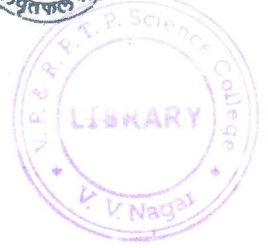




A Charutar Vidya Mandal's Institution
V. P. & R. P. T. P. SCIENCE COLLEGE
 (AUTONOMUS) (Grant-in-Aid)

Affiliated to Sardar Patel University, Vallabh Vidyanagar -388120

Bachelor of Science (Semester IV) Internal Examination-2026
US4MISTA01: Elements of Probability Theory



Date: 10-03-2026 Day: Tuesday

Time: 2:45 pm to 3:45 pm

Total marks: 20

NOTE: The symbols used in this paper have usual meaning unless specified.

Q. 1 Write the most appropriate answer from the following multiple-choice questions. [06]

- (1) A bag contains 5 white and 3 black balls. Two balls are drawn without replacement. The probability that the first ball is white and the second is black is:
 (a) $5/8$ (b) $5/16$ (c) $3/8$ (d) $1/2$
- (2) For any two events A and B , the probability of exactly one occurring is:
 (a) $P(A \cup B) - P(A \cap B)$ (b) $P(A \cap B^c) + P(A^c \cap B)$
 (c) $P(A) + P(B) - 2P(A \cap B)$ (d) All of these
- (3) Three coins are tossed simultaneously. The probability of getting at least two heads is:
 (a) $1/2$ (b) $1/4$ (c) $3/8$ (d) $1/8$
- (4) Let X be a random variable with pdf $f(x) = cx^2$, $|X| \leq 1$, and zero otherwise. Then $c =$ _____
 (a) $2/3$ (b) 3 (c) $3/2$ (d) None of these
- (5) Given that $f(x) = k(1+x)^2$, $x = 0, 1, 2, 3$ and zero otherwise. What will be the value of k so that given $f(x)$ being a p.m.f.1/
 (a) $2/130$ (b) $1/130$ (c) $3/130$ (d) $4/130$
- (6) The value of $k =$ _____ if
- | | | | | | | |
|------|---|----|----|-----|-----|-----|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| f(x) | k | 4k | 9k | 16k | 25k | 36k |
- (a) $1/91$ (b) $1/36$ (c) $4/36$ (d) $3/36$

Q. 2 (A) From a group of 5 male and 3 female students, 3 students are selected randomly:

- (a) Find the probability that all 3 are male.
- (b) Find the probability that exactly 2 are female.

(B)) A factory has three machines M_1 , M_2 , and M_3 producing 30%, 45%, and 25% of the total items respectively. The defective rates of the machines are 2%, 3%, and 5% respectively.

- (a) Find the probability that a randomly selected item is defective.
- (b) If an item is found defective, find the probability that it was produced by M_2 .

OR

Q. 2 (A) In a school, 40% of students play football, 30% play basketball, and 15% play both.

- (a) Find the probability that a randomly selected student plays football or basketball.
- (b) If a student plays basketball, find the probability that they also play football.

(B)) A committee of 4 members is to be formed from 3 officers of production, 4 officers of purchase, and 2 officers of sales.

- (a) Find the probability that the committee has at least one member from production.
- (b) Find the probability that the committee has exactly one member from sales.

Q. 3 (A) Given that $f(x) = k \left(\frac{1}{2}\right)^x$, $x = 0, 1, 2, \dots, 6$ and zero otherwise, is the probability distribution of X : (i) Find k . (ii) Find the c.d.f. of X . (iii) Calculate: (a) $P(X \geq 4)$ (b) $P(2 < X \leq 5)$

(B)) From a group of 5 male and 2 female students, 3 students are selected at random to form a committee to organize a class tour:

- (a) Which method do you prefer for selection – With Replacement or Without Replacement? Justify.
- (b) Find the probability distribution of X , where X is the number of female students selected.
- (c) Find the probability that all the three students selected are of the same gender.

OR

Q. 3 (A) A random variable X has the following probability mass function:

x	1	2	3	4	5	6	7	8
$P(X = x)$	k	k	$3k$	$2k$	$k^2 + k$	$2k^2$	$4k^2 + k$	$3k^2$

(i) Find k (ii) Find the c.d.f. of X (iii) Find the minimum value of k so that $P(X \leq k) = 1/2$.

(B) Let X be a r.v. with pdf $f(x) = k(x + 1)^2$, $-1 < x < 1$, and zero otherwise.

(i) Find k (ii) Find the c.d.f. of X (iii) Calculate $P(|X| < 1/2)$.

All The Best



Seat No:

Student's sign

Supervisor's sign.....

Bachelor of Science (Semester IV) Quiz-2026
US04MISTA01:Elements of Probability Theory

Date: 10-03-2025 (Tuesday)

Time: 10 minutes

Total marks: 05

NOTE: The symbols used in this paper have usual meaning unless specified.

Q. 1 Whether the following statement is true or false. Write your answer in the box. [05]

- (1) If A and B are mutually exclusive, then $P(A \cap B) = 0$. []
- (2) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. []
- (3) For three independent events A, B, C ,
 $P(\text{none of them occurs}) = P(A^c)P(B^c)P(C^c)$. []
- (4) If X is a discrete random variable with probability mass function summing to 1, then each probability $P(X = x_i)$ must satisfy $0 \leq P(X = x_i) \leq 1$. []
- (5) When selecting 3 students from a class of 6 boys and 4 girls at random without replacement, the probability that at least one girl is selected is always greater than the probability that no girl is selected. []

All The Best

