

**Marks: 100****ASSIGNMENT-3****Dead Line: 23-10-24****Subject: Probability and Statistics****Section: ALL**

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Date: 12-10-2024

Q1. The table below shows the probability distribution for a random variable X .

x	0	1	2	3
$P(X = x)$	c	c^2	$c^2 + c$	$3c^2 + 2c$

- (a) Find the value of c .
 (b) Find distribution function $F(X)$ i.e. cdf.
 (c) Find $E(X)$
 (d) Find $V(X)$
 (e) Find $E(2X + 3)$ and $V(5X + 4)$

Q2. The random variable X can take only the values -2, -1, 0, 1, 2. The probability distribution of X is given in the following table.

x	-2	-1	0	1	2
$P(X = x)$	p	p	0.1	q	q

- (a) Given that $P(X \geq 0) = 3P(X < 0)$, find the values of p and q .
 (b) Find distribution function $F(X)$ for X also find $P(X \leq 1)$ using cdf.
 (c) Find $E(X)$
 (d) Find $V(X)$
 (e) Find $E(5X + 3)$ and $V(2X + 1)$

Q3. A random variable X has probability density function $f(x)$ where

$$f(x) = \begin{cases} kx & 0 \leq x < 1 \\ k(2-x) & 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Then find

- (a) The value of k
 (b) $P(0.5 \leq X \leq 1.5)$
 (c) $E(X)$
 (d) $E(X^2)$
 (e) $V(X)$

Q4. The waiting time in hours between successive speeders spotted by a radar unit is a continuous random variable with cumulative distribution function.

$$F(x) = \begin{cases} 0 & x < 0 \\ 1 - e^{-8x} & x \geq 0 \end{cases}$$

Find the probability of waiting less than 0.2 hours between

(a) using the cumulative distribution function of X.

(b) using the probability density function of X.

Q5. Suppose a television contains 20 transistors, 2 of which are defectives. Five transistors are selected at random, removed and inspected.

(a) probability of selecting no defectives,

(b) probability of selecting at least one defective.

(c) probability of selecting at most two defective.

(d) The mean and variance for the number of defectives selected.

Q6. (a) The probability to be caught while running a red light is estimated as 0.1. What is the probability that a person is first caught on his 10th attempt to run a red light?

(b) From past experience it is known that 3% of accounts in a large accounting population are in error. What is the probability that the first account in error is found on the 5th try?

Q7. (A computing center is interviewing people until they find a qualified person to fill a vacant position. The probability that any single applicant is qualified is 0.15.

(a) Find the expected number of people to interview.

(b) Find the probability the center will need to interview between 4 and 8 people (both inclusive).

Q8. (a) Jim is a high school baseball player. He has 0.25 batting average, meaning that he makes a hit in 25% of his tries ("at-bats"). What is the probability that Jim makes his second hit of the season on his sixth at-bat? Also find expectation and variance.

(b) A telemarketer needs to sell 3 insurance policies before lunch. He estimates the probability of a sale as 0.1. How many calls, on average, does he need to make before lunch? What is the probability that he needs exactly 25 calls to reach his goal?

Q9. Number of flaws in a disk follows a Poisson distribution with the mean 0.5. If 5 disks are selected independently,

(a) what is the probability that none of the disks have flaws?

(b) what is the probability that all 5 have a total of 2 flaws?

(c) what is the probability that total of at least 2 flaws?

Q10. There are 25 schools in a district, 10 of which are performing below standard. Five schools are selected at random for an in-depth study. Find:

(a) Probability that in your sample, no schools perform below standard.

(b) Probability of selecting at least one that performs below standard.

(c) The mean and variance for the number of the schools that perform below standard.