

MATHS IV QUESTION BANK

Unit IV (STATISTICAL TECHNIQUES – II)

Short Answers Type questions

1. If the probability of a random variable x with space $R(x) = \{1, 2, 3, \dots, 12\}$ is given by $f(x) = k(2x - 1)$, then, what is the value of the constant k ?
2. An urn contains 9 balls, 2 of which are red, 3 blue and 4 black. 3 balls are drawn at random. What is the probability that all 3 balls are of (i) different colour (ii) same colour.
3. If we randomly pick two television sets in succession from a shipment of 240 television sets of which 15 are defective, what is the probability that they will both be defective?
4. Suppose the random variable X has mean μ and variance $\sigma^2 > 0$. What are the values of the numbers a and b such that $a + bX$ has mean 0 and variance 1?
5. Find the binomial distribution if the mean is 12 and the standard deviation is 2.
6. Find the probability of throwing 9 with two dice.
7. Consider the coin tossing experiment. Construct a random variable X for this experiment. What is the space of this random variable X ?
8. Is the real valued function $f : R \rightarrow R$ defined by $f(x) = 2x^{-2}$ if $1 < x < 2$, 0 otherwise, a probability density function for some random variable X ?
9. A fair coin is tossed 3 times. Let the random variable X denote the number of heads in 3 tosses of the coin. Find the sample space, the space of the random variable, and the probability density function of X .
10. A candidate is selected for interview for three posts. For the first post there are three candidates, for the second there are 4 and for the third there are 2. What is the chance of getting at least one post?

Long Answers Type questions

1. The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accident in a year (ii) more than three accident in a year?
2. In a sample of 1000 cases, the mean of a certain test is 14, and standard deviation is 2.5. Assuming the distribution to be normal, find (i) how many students score between 12 and 15? (ii) how many score above 18? (iii) how many score below 8?

3. A box contains 5 colored balls, 2 black and 3 white. Balls are drawn successively without replacement. If the random variable X is the number of draws until the last black ball is obtained, find the probability density function for the random variable X .
4. Show that Poisson Distribution is limiting case of Binomial Distribution.
5. Fit a Poisson distribution to the following data and calculate theoretical frequencies:

X	0	1	2	3	4
F(X)	122	260	15	2	1

6. Find the probability density function of the random variable X whose cumulative distribution function is $F(x) = 0.00$ if $x < -1$, 0.25 if $-1 \leq x < 1$, 0.50 if $1 \leq x < 3$, 0.75 if $3 \leq x < 5$, 1.00 if $x \geq 5$.
7. An insurance company insures 4000 people against loss of both eyes in a car accident. Based on previous data it was assumed 10 persons out of 1,00,000 will have such kind of injury in car accident. What is probability that more than 2 of the injured will collect on their policy in a given year.
8. The mean inside diameter of a sample of 200 washers produced by a machine is 0.502cm and the standard deviation is 0.005cm. The purpose for which these washers are intended allows a maximum tolerance in the diameter of 0.496 to 0.508 cm, otherwise the washers are considered defective. Determine the percentage of defective washers produced by the machine, assuming the diameters are normally Distributed.
9. Find mean and variance of Binomial Distribution Function.
10. Sixty percent of new drivers have had driver education. During their first year, new drivers without driver education have probability 0.08 of having an accident, but new drivers with driver education have only a 0.05 probability of an accident. What is the probability a new driver has had driver education, given that the driver has had no accident the first year?