**21MA401 PRP**

**Unit I & II Assignment**

**Part A**

1. Define Random Variable.
2. A continuous random variable X has probability density function

f(x) = . Find



1. The cumulative distribution function of a continuous random variable is given by . Find the probability density function and mean of X.



1. A random variable X has the probability density function f(x) given by . Find the value of ‘c’.



1. Given the probability density function, find k such that.



1. If the MGF of a continuous random variable X is given by. Obtain the standard deviation.



1. For a Binomial distribution the mean is 6 and standard deviation is. Find the first two terms of the distribution.



1. Let X be a random variable with moment generating function Find its mean and variance.



1. The number of hardware failures of a computer system in a week of operations has the following probability mass function:

| No of failures | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Probability | 0.18 | 0.28 | 0.25 | 0.18 | 0.06 | 0.04 | 0.01 |

Find the mean of the number of failures in a week.

1. A random variable X is uniformly distributed between 3 and 15. Find the variance of X.
2. The joint probability density function of the random variable is defined as Find the marginal probability density functions of X and Y.



1. The joint probability density function of the random variable is defined as . Find the value of .



1. If the function is to be a density function, find the value of c.



1. If X and Y have joint probability density function . Check whether X and Y are independent.



1. If the joint pdfof (X,Y) is . Find.



1. The two regression equations of two random variables X and Y are 4x-5y+33=0 and 20x-9y=107. Find the mean values of X and Y.
2. Can and be the estimated regression equations of Yand X respectively? Explain your answer.



1. What is the range of the correlation coefficient?
2. If and are independent random variables with variance 2 and 3. Find the variance of 3+ 4.



1. Define Covariance of (X, Y). If X and Y are independent, what will be the Cov (X, Y)?

**Part B**

1. 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 (a) the value of ‘a’ (b) P(X < 3) (c) P(0 < X< 5)

(d)The smallest value of for whichP(X≤)>0.5.



1. A random variable X has the following probability distribution

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P(x) | 0 | k | 2k | 2k | 3k | k2 | 2k2 | 7k2+k |

Find (a) the value of k (b) P(X<6) (c) P(0<X< 5) (d) the minimum value of ‘r’ for

which P(X ≤ r) >1/2.

1. A Random Variable X has the following probability distribution

| X | -2 | -1 | 0 | 1 | 2 | 3 |
| --- | --- | --- | --- | --- | --- | --- |
| P(x) | 0.1 | K | 0.2 | 2k | 0.3 | 3k |

Find (a) the value of k (b) P(X < 2) (c) P(-2 < X< 2) (d) The cumulative distribution function of X.

1. A continuous RV X has probability density function given by f(x)= 3x2, 0≤x≤1 . Find ‘a’ and ‘b’ such that (i) and (ii).



1. A random variable X has probability function . Find the MGF,



mean and variance.

1. A random variable X has the following probability distributionFind (a). P(X is even) (b). P(X≥5)(c). P(X is divisible by 3).



1. If the probability mass function of a random variable X is given by find K, distribution function, mean and variance.



1. A random variable X has the probability density function find (a) P(X<1/2) (b) .



1. If is pdf of a random variable X,then find



a)A b)P(0.2<X<0.5) c)



1. A continuous random variable X that can assume any value between x=2 and x=5 has a density function given by ***f(x)= k(1+x).*** Find P(X<4).
2. Let the random variable X have the pdf. Find the moment generating function,mean and variance of X.



1. Find the MGF,mean and variance of a random variable X having the probability density function



1. If X is a random variable with pdfFind Mean , variance and MGF.



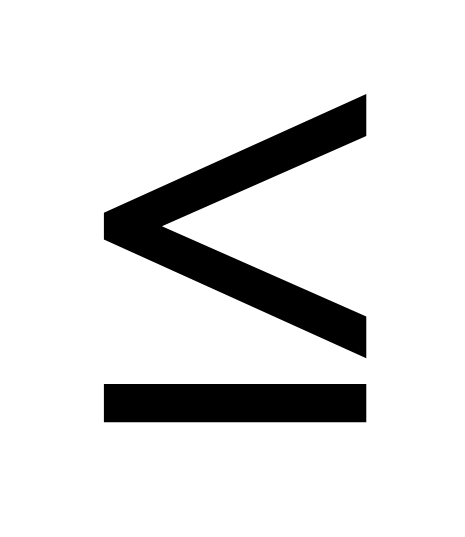
1. Find the rthmoment about the origin for the distribution with pdf . Hence find the first four moments about origin.



1. The density function of a random variable X is given by



Find K, mean, variance and rth moments about the origin.

1. Find the moment generating function of Binomial distribution and hence find its mean and variance.
2. Find the moment generating function of Poisson distribution and hence find its mean and variance.
3. Find the moment generating function of Geometric distribution and hence find its mean and variance.
4. Find the moment generating function of Uniform distribution and also find its mean and variance.
5. Find the moment generating function of Exponential distribution and hence find its mean and variance.
6. Find the moment generating function of Normal distribution and hence find its mean and variance.
7. State and prove memory less property of Exponential distribution.
8. If X is a Poisson random variable such that then find mean, variance and P(X3)



1. A manufacturer of pins knows that 2% of his products are defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality?
2. In a large consignment of electric bulbs 10% are defective. A random sample of 20 is taken for inspection. Find the probability that

(a) All are good bulbs

(b) atmost there are 3 defective bulbs

(c) Exactly there are 3 defective bulbs.

1. If the probability that an applicant for a driver’s license will pass the road test on any given trial is 0.8. What is the probability that he will finally pass the test

(a) on the fourth trial

(b) in fewer than 4 trials?

1. Suppose that a trainee soldier shoots a target in an independent fashion. If the probability that the target is shot on any one shot is 0.7. (i)What is the probability that the target would be hit on tenth attempt? (ii)What is the probability that it takes him less than 4 shots? (iii)What is the probability that it takes him an even number of shots?
2. The number of monthly breakdown of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (a) without a breakdown (b) with only one breakdown and (c) with atleast one breakdown.
3. In a certain factory turning razor blades, there is a small chance of 1/500 for any blade to be defective. The blades are in packets of 10.Use Poisson distribution to calculate the approximate number of packets containing (i) no defective (ii) 1 defective (iii) 2 defective blades in a consignment of 10000 packets.
4. The daily consumption of milk in excess of 20000 gallons is approximately exponentially distributed with λ=3000.The city has a daily stock of 35000 gallons. What is the probability that of 2 days selected at random the stock is insufficient for both days? .
5. The time (in hrs) required to repair a machine is exponentially distributed with parameter λ=1/2.What is the probability that (i) a repair takes atleast 10 hrs given that its duration exceeds 9 hrs.(ii) the repair exceeds 2 hrs.
6. The time (in hrs) required to repair a machine is exponentially distributed with parameter λ=1/2.What is the probability that (i) a repair takes atleast 10 hrs given that its duration exceeds 9 hrs.(ii) the repair exceeds 2 hrs.
7. Four buses arrive at a specified stop at 15 minute interval starting at 7 am. If a passenger arrives at the stop at a time that is uniformly distributed between 7 and 7.30am, find the probability that he waits

(a) less than 5 min for a bus

(b) more than 10 min for a bus?

1. A random variable X has a uniform distribution over (-3,3). Compute
2. P(X<2) (b). P( (c). Find K for which P(X>K)=1/3.
3. If X is Uniformly Distributed over (0, 10) find

(a) P(X < 4), (b) P(X >6), (c) P(2 < X < 5).

1. For the following Bivariate probability distribution of (X,Y), find

| x/y | |  |  | Y |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 |
| X | 0 | 0 | 0 | 1/32 | 2/32 | 2/32 | 3/32 |
| 1 | 1/16 | 1/16 | 1/8 | 1/8 | 1/8 | 1/8 |
| 2 | 1/32 | 1/32 | 1/64 | 1/64 | 0 | 2/64 |

(i)P(X≤1) (ii) P(Y≤3) (iii) P(X≤1/ Y≤3) (iv) P(X+Y)≤ 4 . Also find all the marginal and conditional probability distributions .

1. The joint probability mass function of is given by, ,. Find all the marginal and conditional distributions. Also find the probability distribution of .



1. The two dimensional random variablehas the joint density function , ; . Find all the marginal and conditional distributions of X and Y .



1. Let and be two discrete random variable with joint probability mass function



. Find the marginal probability function of and . Also find .



1. The joint probability density function of a two dimensional random variable is given by . Find the value of , marginal and conditional density functions of X and Y.



1. Given .



1. Evaluate c, (b) findand .



1. The joint probability density function of a two dimensional random variable is given by . Compute (i) (ii) (iii) (iii) .



1. If X and Y are two random variable having joint density function

,



findand



1. The joint probability density function of a two dimensional random variable is given by . Compute (i) (ii) (iii) (iv) (v) and (vi) .



1. The joint density function of two random variables X and Y is

. Find .



1. Given the joint pdfof. Find the marginal densities of and. Are and independent?



1. The joint probability density function of the random variable is given by



. Find the value of k and also prove that X and



Y are independent.

1. If the joint distribution function of X and Y is given by



Find (a) marginal density of X and Y. (b) Are X and Y are independent?

1. Given the joint probability density function of as . Find the marginal and conditional probability density functions of and.



1. Assume that the random variables X and Y have the joint probability density function . Determine if X and Y are independent.



1. If the joint probability density function of a two dimensional random variables (X,Y) is given by , Find Cov (X,Y)



1. If the joint pdf of is . Find the



Covariance of .



1. Let and be two discrete random variable with joint probability mass function

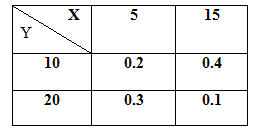


. Find the co-efficient of correlation.



1. Find correlation of for the following discrete bivariate distribution





1. Calculate the correlation coefficient and regression lines between X and Y for the following data

| X | 10 | 14 | 18 | 22 | 26 | 30 |
| --- | --- | --- | --- | --- | --- | --- |
| Y | 18 | 12 | 24 | 6 | 30 | 36 |

1. From the following data, find (a) the two regression equations, (b) the co-efficient of correlation between the marks in Mathematics and Statistics, (c) the most likely marks in Statistics when marks in Mathematics are 30.

| Marks in Mathematics | 25 | 28 | 35 | 32 | 31 | 36 | 29 | 38 | 34 | 32 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks in Statistics | 43 | 46 | 49 | 41 | 36 | 32 | 31 | 30 | 33 | 39 |

1. Find the correlation coefficient and regression lines for the following heights   
   (in inches) of Fathers X and their Sons Y.

| **X** | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Y** | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

1. Calculate the correlation coefficient and regression lines from the following data:

| X | 12 | 9 | 8 | 10 | 11 | 13 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Y | 14 | 8 | 6 | 9 | 11 | 12 | 3 |

| X | 55 | 56 | 58 | 59 | 60 | 60 | 62 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Y | 35 | 38 | 38 | 39 | 44 | 43 | 44 |

1. For the following data find the correlation coefficient and regression lines between the random variables X and Y
2. If is the joint pdf of the random variables and , find the correlation co-efficient of and .



1. Two independent random variables and are defined by



= and =



Show that and are uncorrelated.



1. If X and Y are two random variables having joint density function

= . Find the correlation coefficient.



1. If the independent random variable X and Y have variences 36 and 16 respectively, find the correlation coefficient between X+Y and X-Y.
2. In a partially destroyed laboratory record only the lines of regressions and variance of x are available. The regression equations are and variance of x = 9. Find (a). The mean values of x and y. (b). Correlation coefficient between X andY.



1. Let be a two dimensional random variable with joint density



. Find the density function of U = .



1. If and each follow exponential distribution with parameter 1 and are independent, findthe probability density function of .



1. If and are independent random variables with p.d.f and respectively. Find the density function of & . Are and independent?



1. If the joint probability density functionof is . Find the probability density functionof .

