1. What do you mean by conditional mean and conditional variance?
2. Write down condition for independence of random variables
3. What do you mean by joint probability distribution? Differentiate between joint pmf and joint pdf
4. What do you mean by marginal probability distribution? Differentiate between marginal pmf and marginal pdf
5. What do you mean by conditional probability distribution? Differentiate between conditional pdf and conditional pmf
6. Let p(x,y) = , x = 1,3 and y = 2, 4; p(y) = , find E(X/Y = 2) and V(X/Y = 2).

**[Ans: 7/3, 8/9]**

1. Let f(x,y) = 2x , 0 < x < 1 , y > 0 , f(x) = 2x and f(y) = . Find E(Y/X) and V(Y/X)

**[Ans: 1, 1]**

1. If two random variables have the joint probability density function

f(x,y) =6 (x+y2 )/5 for 0<x<1 , 0<y<1

0 elsewhere

Find the probability that i) 0.2 < x < 0.5 and 0.4< y < 0.6 ii) x and y (Ans: 0.43, 0.28)

1. If two random variables X1 and X2 have the joint probability density function

f(x₁,x₂) = (x1 + 2x2) for 0<x1<1 , 0<x2<1

0 elsewhere

Find the conditional density function of X1 given X2 and X2 given X­1  (Ans: , )

1. Let (X,Y) be two dimensional random variable with joint pmf

P(x,y)=(x-y+3)/48 ; x=0,1,2,3 ;y=0,1,2,3

Find i) marginal pmf of X and Y ii) conditional distribution of X for given Y=1 iii) conditional distribution of Y for given X=2. (Ans: , , , )

1. Given the following bivariate probability distribution of X & Y.

|  |  |  |  |
| --- | --- | --- | --- |
| X  Y | -1 | 0 | 1 |
| 0 | 1/15 | 2/15 | 1/15 |
| 1 | 3/15 | 2/15 | 1/15 |
| 2 | 2/15 | 1/15 | 2/15 |

Find i) P(X=1,y≤1) ii)P (Y≤1) iii) P(X=-1) (Ans: 2/5 , 2/3 , 2/5)

12. A company has 3 hardware engineering consultant and 4 software engineering consultants. From this 2 engineering consultants are selected at random. Let X denote the number of hardware engineering consultant and Y denotes the number of software engineering consultant.. Find the i)joint probability distribution of X & Y. ii)marginal distribution of X and that of Y iii)conditional distribution of X for given Y.

13. A two dimensional discrete random variable (XY) has the joint probability distribution as given below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Y X | 0 | 1 | 2 | 3 |
| -1 | 0.03 | 0.02 | 0.05 | 0 |
| 0 | 0.01 | 0.25 | 0.45 | 0.01 |
| 1 | 0 | 0.03 | 0.05 | 0.10 |

Determine i) marginal distribution of X & Y ii)Conditional distribution of X for given Y and that of Y for given X iii) P(X=0,Y≤2) iv) P(X≥0,Y<3) v)P(X≤0/Y=1)

1. Let two dimensional random variable (X,Y) have joint pdf

f(x,y)= k(6-x-y) ; 0≤x≤2 , 2≤y≤4

1. elsewhere

Determine i) constant k ii) P(X≤1∩Y<3) iii)P (Y≤3) iv) P(X≤1/Y≤3)

(Ans:1/8 , 13/32 , 5/8 , 3/8)

15. Joint distribution of X & Y are given by f(x,y)=4xye-(x2 +y2) ; x≥0 , y≥0

i) find conditional pdf of X given Y ii) test whether X and Y are independent.

(Ans:2x , independent)

1. If f(x,y)=k(2x+3y) : 0≤x≤1 ; 0≤y≤1

Find (a)Constant k b)Conditional pdf of x given y & that of y given x c)x & y are independent or not

d) V(X), V(Y) e) V(XY), COV(X,Y), r(X,Y) f) E(3X+2Y) , V(3X-2Y)

(Ans: 2/5 , , ,dependent , 0.078 , 0.073 , 0.055 , -1/150 , -0.095 ,2.9 ,0.99)

1. If P(x,y)=k(x+y) : x=1,2,3 ; y=1,2

Find a)Constant k b)Conditional pmf of x given y & that of y given x c)x & y are independent or not

d) V(X), V(Y) e) V(XY), COV(X,Y), r(X,Y) f) E(2X-3Y) , V(2X+3Y)

(Ans:1/21 , , ,dependent ,0.63 , 0.24 , 2.81 , -0.013 , -0.034 , -0.33 , 4.56)

1. If f(x,y)=ke—(x+y) : 0≤x∞ ; 0≤y≤∞

Find a)Constant k b)Conditional pdf of x given y & that of y given x c)x & y are independent or not

d) V(X), V(Y) e) V(XY), COV(X,Y), r(X,Y) f) E(3X-2Y) , V(3X+2Y)

(Ans: 1 , , , independent , 1 , 1, 3 , 0 ,0 , 1 ,13 )

1. The joint pdf of two random variable X and Y is given by

f(x,y) = ; 0 .find the marginal pdf of x and that of y, conditional pdf of y given x