EE3060 Probability – HW4 Proposed questions and answers

Problem 1

Question:

Let X and Y be discrete random variables with joint mass function defined by

fx,y(x,y) = 1/3 (x,y) ∈{(0,1), (1,1), (1,0)}

What is the covariance of XY: covx,y(x,y)?

Answer:

fx(x) = Σy = fx,y(x,y) = {1/3, x = 0

2/3,  x =1

Efx[x] = Σ1x = 0 xfx(x) = ((0)\*(1/3) +(1)\*(2/3)) = 2/3

Efx[x2] = Σ1x = 0 x2fx(x) = ((0)2\*(1/3) +(1)2\*(2/3)) = 2/3

varfx[x] = Efx[x2] – (Efx[x])2

= (2/3) – (2/3)2

= 2/9

fy(y) = Σx = fx,y(x,y) = {1/3, y = 0

2/3,  y =1

Efy[y] = Σ1y = 0 yfy(x) = ((0)\*(1/3) +(1)\*(2/3)) = 2/3

Efy[y2] = Σ1y = 0 y2fy(y) = ((0)2\*(1/3) +(1)2\*(2/3)) = 2/3

varfy[y] = Efy[y2] – (Efy[y])2

= (2/3) – (2/3)2

= 2/9

Efx,y[xy] = Σx Σy xy fx,y(xy) = ( (0\*1)(1/3) + (1\*1)(1/3) + (1\*0)(1/3) )

= 1/3

covx,y(x,y) = Efx,y[xy] - Efx[x] Efy[y]

= (1/3) – ( (2/3) \*(2/3))

= -(1/9)

Problem 2

Question

We define the joint density function of X and Y as :

*f X ,Y* (*x , y*)=1 *for*(*x , y*)∈{(0,0)*,*(1,1)*,*(1*,*−1)*,*(2,0)}*,*0 *otherwise* 4



(a) Find the covariance of X and Y, 𝐶𝑜𝑣(𝑥,𝑦).

(b) Find the correlation coefficient of X and Y, 𝜌𝑋𝑌.

