

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
ELECTRICAL ENGINEERING DEPARTMENT

EE 315

Quiz #6

Name: Solution

ID#: _____

Section No: _____

Q1: The joint density of the random variables X and Y is given by:

$$f_{X,Y}(x,y) = \begin{cases} \frac{2}{43}(x+0.5y)^2 & 0 < x < 2 \quad \text{and} \quad 0 < y < 3 \\ 0 & \text{elsewhere} \end{cases}$$

Are X and Y uncorrelated?

To check this, we have to calculate:

$$C_{XY} = R_{XY} - E[X]E[Y]$$

$$E[X] = \int_0^3 \int_0^2 x \frac{2}{43} (x+0.5y)^2 dx dy$$
$$= \frac{57}{43}$$

$$E[Y] = \int_0^3 \int_0^2 y \frac{2}{43} (x+0.5y)^2 dx dy$$
$$= \frac{321}{172}$$

$$R_{XY} = E[XY]$$
$$= \int_0^3 \int_0^2 xy \frac{2}{43} (x+0.5y)^2 dx dy$$
$$= \frac{417}{172}$$

$$\therefore C_{XY} = R_{XY} - E[X]E[Y]$$
$$= \frac{417}{172} - \left(\frac{57}{43}\right)\left(\frac{321}{172}\right)$$
$$\approx -0.0495$$

Since $C_{XY} \neq 0$, then X and Y are correlated.