

ELEG 3143 Assignment # 9

1. The joint PMF of two discrete RVs X and Y are given as follows

$$p_{XY}(0,0) = 0.2, p_{XY}(0,1) = 0.3, p_{XY}(0,2) = 0.1$$

$$p_{XY}(1,0) = 0.05, p_{XY}(1,1) = 0.15, p_{XY}(1,2) = 0.2$$

- (a) Find the marginal PMF of X
 - (b) Find the marginal PMF of Y
 - (c) Find the conditional PMF $\Pr(Y = i|X = 0)$, and verify that the sum of the conditional PMF is 1.
2. Two random variables have a joint CDF defined by

$$F_{XY}(x,y) = \begin{cases} 0, & x < 0, y < 0 \\ xy, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 1, & x > 1, y > 1 \end{cases} \quad (1)$$

- (a) Find the joint pdf $f_{XY}(x,y)$.
 - (b) Find the joint probability of the events $\{X \leq 3/4\}$ and $\{Y > 1/4\}$.
3. Two random variables have a joint pdf defined by

$$f_{XY}(x,y) = \begin{cases} kxy, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{elsewhere} \end{cases} \quad (2)$$

- (a) Determine the value of k
 - (b) Find the joint CDF.
 - (c) Find the joint probability of the events $\{X \leq 1/2\}$ and $\{Y > 1/2\}$.
4. (a) Find $\mathbb{E}[XY]$ if the joint CDF is defined in equation (1).

- (b) Find $\mathbb{E}[XY]$ if the joint pdf is defined in equation (2).
5. For the joint pdf defined in equation (2), find $f_{X|Y}(x|y)$.
6. Two random variables have joint pdf

$$f_{XY}(x, y) = \begin{cases} kxy, & 0 \leq y \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases} \quad (3)$$

- (a) Find k .
- (b) Find $f_Y(y)$
- (c) Find $f_{X|Y}(x|y)$.
- (d) Find $\mathbb{E}[XY]$.