

9. Let  $f(x, y) = 2I_{(0,y)}(x)I_{(0,1)}(y)$  be the joint pdf of  $X$  and  $Y$ .
- (a) Find the conditional means  $E(X|Y)$  and  $E(Y|X)$ .
  - (b) Find the correlation coefficient of  $X$  and  $Y$ .
10. A random variable  $X$  has a *Poisson*( $\lambda$ ) distribution. Given  $X = k$ ,  $Y$  has a binomial  $bin(k, p)$  distribution.
- (a) Using the relation  $E(e^{tY}) = E(E(e^{tY}|X))$  and the uniqueness of moment generating function show that  $Y$  has a *Poisson*( $\lambda p$ ) distribution.
  - (b) Show that  $Y$  and  $X - Y$  are independent and find the conditional distribution of  $X$  given  $Y = y$ .