Problem 1

A manufacturing company employs two inspecting devices to sample a fraction of their output for quality control purposes. The first inspection monitor is able to accurately detect 99.3% of the defective items it receives, whereas the second is able to do so in 99.7% of the cases. Assume that four defective items are produced and sent out for inspection. Let X and Y denote the number of items that will be identified as defective by inspecting devices 1 and 2, respectively. Assume the devices are independent. Determine (a) fXY (x, y) (b) fX(x) (c) E(X) (d) fY |X=2(y) (e) E(Y |X = 2) (f) Var(Y |X = 2) (g) Are X and Y independent? (h) Cov(x, y) (i) ρx,y

Problem 2

Consider the joint probability density function fXY (x, y) = c(x+y) over the range 0 < x < 3 and x < y < x + 2 Determine (a) c (b) P(X < 1, Y < 2) (c) P(1 < X < 2) (d) P(Y > 1) (e) P(X < 2, Y < 2) (f) E(X) (g) Marginal probability distribution of X (h) Conditional probability distribution of Y given that X = 1 (i) E(Y |X = 1) (j) P(Y > 2|X = 1) (k) Conditional probability distribution of X given that Y = 2 (l) Cov(x, y) (m) ρx,y

Problem 3

Consider the joint probability mass function fXY (x, y) = c(x + y) over the nine points with x = 1, 2, 3 and y = 1, 2, 3. Determine a)The conditional probability distribution of Y given that X = 1. (b) The conditional probability distribution of X given that Y = 2. (c) E(Y |X = 1) (d) Are X and Y independent? (e) Cov(x, y)

(f) ρx,y