

**PROBLEM 1**

Let  $(X,Y)$  be a bidimensional random variable, with joint pdf given by

$$p_{X,Y}(x,y) = \begin{cases} 1 & ; \text{ if } |y| < x \text{ and } 0 < x < 1 \\ 0 & ; \text{ otherwise} \end{cases}$$

Find:

- a) The marginal distributions of Y and X
- b) The conditional distributions
- c) Pearson's correlation coefficient

**PROBLEM 2**

The joint pdf of random variables  $X_1$  and  $X_2$  is given by

$$p_{X_1,X_2}(x_1,x_2) : G\left(\begin{bmatrix} m_1 \\ m_2 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right)$$

Obtain the pdf of r.v.  $Y = X_1 + X_2$ .

**PROBLEM 3**

$X_1$  and  $X_2$  represent two independent random variables with exponential distributions:

$$\begin{aligned} p_{X_1}(x_1) &= a \exp(-ax_1); & x_1 > 0 \\ p_{X_2}(x_2) &= a \exp(-ax_2); & x_2 > 0 \end{aligned}$$

Obtain the pdf of r.v.  $Y = X_1 + X_2$ .

**PROBLEM 4**

Knowing that X is a random variable with uniform distribution between 0 and 1 ( $U(0,1)$ ), obtain the analytical expression for the pdf of  $Y = X^2$  and  $Z = 1 / X$ .