AI1103-Assignment 2

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Download latex-tikz codes from

https://github.com/asishcs2011010/demo/blob/main/Assignment−2/assignment−2(1).tex

QUESTION NO

Gate-EC Q-38

Question

Let $X \in \{0,1\}$ and $Y \in \{0,1\}$ be two independent binary random variables. if P(X = 0) = p and P(Y = 0) = q, then P($X + Y \geqslant 1$) is equal to

(A) $pq + (1-p)(1-q)$ (C) $p(1-q)$
(B) pq (D) $1-pq$

Solution

Given Pr(X=0) = p , Pr(Y=0) = q and X and Y are independent binary random variables.

X	$X=0$	$X=1$
Pr	p	$1-p$

Y	$Y=0$	$Y=1$
Pr	q	$1-q$

.
Let Z be the convolution of X,Y.
Z=X+Y,
Pr(Z = z) = $\sum Pr$(X = k) × Pr(Y = $z-k$) (for independent discrete random variables)

Pr($Z < 1$) = P(Z = 0)(Z= 0, 1, 2)
Pr($Z = 0$) = $\sum$ Pr($X = k$)× Pr($Y = z-k$)
. = Pr(X = 0)× Pr(Y = 0)
. = pq

Pr($X + Y \geq 1$) = 1− Pr($X + Y < 1$)
Pr($Z \geq 1$) = 1−Pr($Z < 1$)
. = 1-pq