AI 1103 Assignment-3

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Download all latex-tikz codes from

https://github.com/Shantanu467/AI1103/blob/main/Assignment_3/Assignment3.tex

Problem

Gate 2010 (MA): QUESTION-48

Let X and Y be continuous random variables with joint probability density function

$$f(x,y) = \begin{cases} a \times e^{-2y} & 0 < x < y < \infty \\ 0 & otherwise \end{cases}$$

The value of a is

(A) 4
(B) 2
(C) 1
(D) 0.5

Solution

Using, Total PDF $(\Pr(-\infty < X < \infty)) = 1$
So,

$$\int_{y=\infty}^{+\infty}\int_{-\infty}^{x=y} f(x,y)\,\mathrm{d}x\,\mathrm{d}y = 1 \tag{1}$$

$$0 + \int_{y=0}^{} \int_{x=0}^{} a \times \mathrm{e}^{-2y}\,\mathrm{d}x\,\mathrm{d}y = 1 \tag{2}$$

$$a \times \int_{y=0}^{y=\infty} \left(y\mathrm{e}^{-2y}\right)\,\mathrm{d}y = 1 \tag{3}$$

$$a \times \frac{1}{4} = 1 \tag{4}$$

$$\text{So, } a = 4 \tag{5}$$

Therefore, the correct option is (A).