

AI1103: Assignment 2

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Download all python codes from

[https://github.com/yuvrajshekhawat1989/
Assignment-2/tree/main/Codes](https://github.com/yuvrajshekhawat1989/Assignment-2/tree/main/Codes)

and latex-tikz codes from

[https://github.com/yuvrajshekhawat1989/
Assignment-2.git](https://github.com/yuvrajshekhawat1989/Assignment-2.git)

GATE EC 2008 (PROBLEM 29)

$P_x(x) = Me^{-2|x|} + Ne^{-3|x|}$ is the probability density function for the real random variable X, Over the entire x axis. M and N are both positive real numbers. Find The equation relating M and N

SOLUTION 29

$$P_x(x) \geq 0$$

$$\text{Since } \int_{-\infty}^{\infty} P_x(x) dx = 1$$

$$\int_{-\infty}^{\infty} (Me^{-2|x|} + Ne^{-3|x|}) dx = 1$$

$$2 \int_0^{\infty} (Me^{-2|x|} + Ne^{-3|x|}) dx = 1 \quad (\text{Since this is an even function})$$

$$2 \int_0^{\infty} (Me^{-2x} + Ne^{-3x}) dx = 1$$

$$2 \left(M \frac{e^{-2x}}{-2} + N \frac{e^{-3x}}{-3} \right) \Big|_0^{\infty} dx = 1$$

$$2 \left(0 - \left(\frac{M}{-2} + \frac{N}{-3} \right) \right) = 1$$

$$2 \left(\frac{M}{2} + \frac{N}{3} \right) = 1$$

$$M + \frac{2N}{3} = 1$$