GATE 2021 ME 3Q

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Question: The Dirac-delta function ($\delta(t-t_0)$) for $t, t_0 \in \mathfrak{R}$, has the following property

$$\int_a^b \phi(t)\,\delta(t-t_0)\,dt = \begin{cases} \phi(t_0) & a < t_0 < b \\ 0 & otherwise \end{cases} \tag{1}$$

The Laplace Transform of the Dirac-delta function $\delta(t-a)$ for $a > 0$; $\mathcal{L}(\delta(t-a)) = F(s)$ is

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Solution:

Parameter	Description
$F(s)$	Laplace transform of $\delta(t-a)$

TABLE 1: Table of parameters

By (1) and $a > 0$,

$$F(s) = \int_0^\infty \delta(t-a)\,e^{-st}dt \tag{2}$$

$$\therefore F(s) = e^{-as} \tag{3}$$