Assignment IN 40Q

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QUESTION

The signal $x(t) = (t-1)^2 u(t-1)$, where u(t) is unitstep function, has the Laplace transform X(s). The Value of X(1) is

- 1) $\frac{1}{\frac{e}{2}}$ 2) $\frac{2}{\frac{e}{2}}$ 3) 2e
- 4) e^{2}

(GATE 2022 IN 40)

Solution:

$$x(t) = (t-1)^2 u(t-1)$$
 (1)

Taking Laplace-Transform:

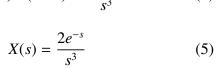
$$t^n u(t) \leftrightarrow \frac{n!}{s^{n+1}} \tag{2}$$

if X(s) is Laplace transform of x(t) then,

$$x(t - t_0) = e^{-st_0} X(s)$$
 (3)

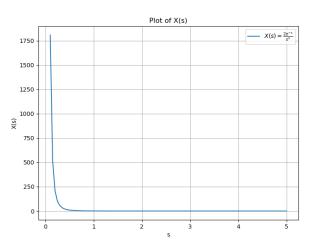
using 2 and 3

$$(t-1)^2 u(t-1) \leftrightarrow \frac{2e^{-s}}{s^3} \tag{4}$$



$$X(1) = \frac{2}{e} \tag{6}$$





(5) Fig. 1. $X(s) = 2e^{-s}/s^3$