

# Assignment IN\_40Q

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## QUESTION

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

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

(GATE 2022 IN 40)

**Solution:**

PARAMETER	VALUE	DESCRIPTION
$x(t)$	$x(t) = (t-1)^2 u(t-1)$	Function
$X(s)$	$X(s) = \frac{2e^{-s}}{s^3}$	laplace transform of $x(t)$

TABLE I  
INPUT PARAMETER TABLE

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

Taking Laplace-Transform:

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

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

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

using 2 and 3

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

$$X(s) = \frac{2e^{-s}}{s^3} \quad (5)$$

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

$\therefore$  2 is Correct.

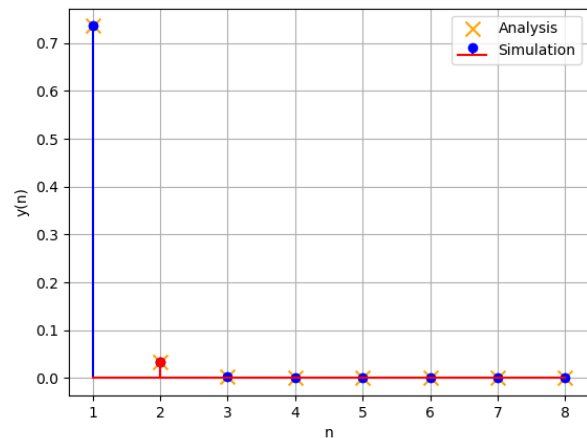


Fig. 1.  $X(s) = 2e^{-s}/s^3$