

GATE 2022 BIOMEDICAL ENGINEERING

EE:1205 Signals and systems
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I. QUESTION 40

The block diagrams of an ideal system and a real system with their impulse responses are shown below. An auxiliary path is added to the delayed impulse response in the real system.

For a unit impulse input ($x(t) = \delta(t)$) to both systems, gain β is chosen such that $y(4T)$ is same for both systems. The value of β is:

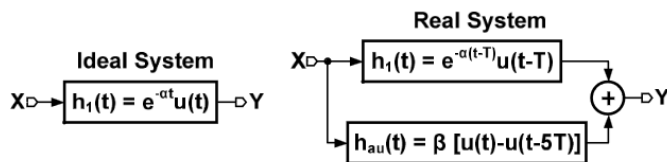
For both signals to be equal at $t = 4T$:

$$e^{-\alpha 4T} u(4T) = \left[\beta (u(4T) - u(-T)) + e^{-\alpha(3T)} u(3T) \right] \quad (1)$$

$$e^{-\alpha 4T} = \beta + e^{-\alpha 3T} \quad (2)$$

$$\Rightarrow \beta = e^{-3\alpha T} (1 - e^{-\alpha T}) \quad (3)$$

Hence the answer is (C)



(A) $e^{-3\alpha T} (1 - e^{-2\alpha T})$

(B) $-e^{-\alpha T} (1 - e^{-3\alpha T})$

(C) $e^{-3\alpha T} (1 - e^{-\alpha T})$

(D) $e^{-2\alpha T} (1 - e^{-2\alpha T})$

II. SOLUTION

No.	Output	Function
1	y_I	$e^{-\alpha t} u(t)$
2	y_R	$\beta (u(t) - u(t-5T)) + e^{-\alpha(t-T)} u(t-T)$

TABLE 0
VALUES