GATE 2022 BIOMEDICAL ENGINEERING
EE:1205 Signals and systems
Indian Institute of Technology, Hyderabad

Sai Preetam Umesh Sasankota

EE23BTECH11221

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:
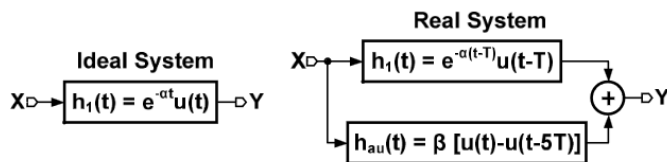

(A) $e^{-3\alpha T}\left(1 - e^{-2\alpha T}\right)$

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

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

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

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

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

$$e^{-\alpha 4T} = \beta + e^{-\alpha 3T} \tag{2}$$

$$\implies \beta = -e^{-3\alpha T}\left(1 - e^{-\alpha T}\right) \tag{3}$$

Hence the answer is (C)

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