

GATE ASSIGNMENT 2

Dhatri Nanda - AI20BTECH11002

Download latex-tikz codes from

https://github.com/Dhatri-nanda/EE3900/blob/main/Gate_2/Gate_2.tex

QUESTION

GATE 2010 Q.14

Consider the Z-transform $X(z) = 5z^2 + 4z^{-1} + 3$, $0 < |z| < \infty$. The inverse Z-transform $x[n]$ is

- A) $5\delta[n+2] + 3\delta[n] + 4\delta[n-1]$
- B) $5\delta[n-2] + 3\delta[n] + 4\delta[n+1]$
- C) $5u[n+2] + 3u[n] + 4u[n-1]$
- D) $5u[n-2] + 3u[n] + 4u[n+1]$

SOLUTION

Given, Z-transform

$$X(z) = 5z^2 + 4z^{-1} + 3 \quad (0.0.1)$$

ROC = $0 < |z| < \infty$

If $X(z)$ is the Z-transform of $x(n)$,

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \quad (0.0.2)$$

And if δ is the impulse response, then

$$x(n) = \sum_{k=-\infty}^{\infty} x(k)\delta(n-k) \quad (0.0.3)$$

Therefore, from (0.0.2) and (0.0.3)

$$\delta(n+a) \xleftrightarrow{z} z^a \quad (0.0.4)$$

The inverse transform

$$x(n) = Z^{-1}[X(z)] \quad (0.0.5)$$

$$= 5\delta[n+2] + 3\delta[n] + 4\delta[n-1] \quad (0.0.6)$$

Option (A) is correct.