

# GATE ASSIGNMENT 2

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## 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  $\delta$  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.