

Gate Assignment 1

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Download the python codes from:

https://github.com/tanayyadav28/EE3900-Assignments/blob/main/GateAssignment_1/GateAssignment_1.py

Download the latex-tikz codes from:

https://github.com/tanayyadav28/EE3900-Assignments/blob/main/GateAssignment_1/GateAssignment_1.tex

The system transfer function $H(z)$ is given as:

$$H(z) = \frac{Y(z)}{X(z)} \quad (2.0.4)$$

$$H(z) = \frac{1}{1 - \frac{5}{6}Z^{-1} + \frac{1}{6}Z^{-2}} \quad (2.0.5)$$

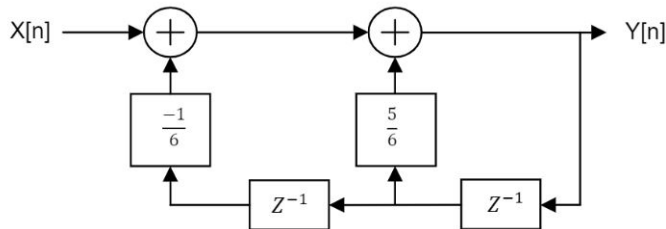
$$= \frac{Z^2}{Z^2 - \frac{5}{6}Z + \frac{1}{6}} \quad (2.0.6)$$

$$= \frac{Z^2}{(Z - \frac{1}{2})(Z - \frac{1}{3})} \quad (2.0.7)$$

1 PROBLEM

[Gate EC 2015; Q44]

For the discrete-time system shown in the figure, the poles of the system transfer function are located at:



The poles can be found by solving the denominator:

$$\left(Z - \frac{1}{2}\right)\left(Z - \frac{1}{3}\right) = 0 \quad (2.0.8)$$

Therefore, the poles of the system transfer function are located at $\frac{1}{2}$ and $\frac{1}{3}$ (Option 3).

1) 2, 3

2) $\frac{1}{2}, 3$

3) $\frac{1}{2}, \frac{1}{3}$

4) $2, \frac{1}{3}$

2 SOLUTION

The difference equation of the given discrete-time system is :

$$y[n] = x[n] - \frac{1}{6}y[n-2] + \frac{5}{6}y[n-1] \quad (2.0.1)$$

$$\therefore x[n] = y[n] - \frac{5}{6}y[n-1] + \frac{1}{6}y[n-2] \quad (2.0.2)$$

Applying z-transform to (2.0.2),

$$X[z] = Y[z] \left(1 - \frac{5}{6}Z^{-1} + \frac{1}{6}Z^{-2}\right) \quad (2.0.3)$$