GATE - BM 22

EE23BTECH11215 - Penmetsa Srikar Varma

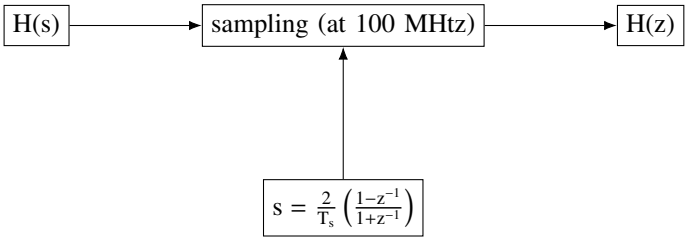
Question

A continous time transfer function, H(s) = $\frac{1+\frac{s}{10^6}}{s}$ is coverted to a discrete time transfer function, H(z) using a bi-linear transformation at 100 MHz sampling rate. The pole of H(z) is located at z = ?

Solution

Variable	Condition
F_s = 100 MHz	sampling rate
$T_s = \frac{1}{F_s}$	sampling period
s_0	pole of H(z)

Table of Parameters



From above,

$$H(z) = H\left(2F_s\left(\frac{1-z^{-1}}{1+z^{-1}}\right)\right) \tag{1}$$

So, from (1)

$$H(z) = \frac{1+\frac{2F_s}{10^6}\left(\frac{1-z^{-1}}{1+z^{-1}}\right)}{2F_s\left(\frac{1-z^{-1}}{1+z^{-1}}\right)} \tag{2}$$

$$H(z) = \frac{1}{200\times10^6}\left(\frac{1+z^{-1}+200\left(1-z^{-1}\right)}{1-z^{-1}}\right) \tag{3}$$

$$H(z) = 5\times10^{-9}\left(\frac{201-199z^{-1}}{1-z^{-1}}\right) \tag{4}$$

So, s_0 is at z=1