Quiz-2

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1 QUESTION

A casual LTI systemhas impulse response h[n],for which z-transform is:

$$H(z) = \frac{1 + z^{-1}}{(1 - \frac{1}{2}z^{-1})(1 + \frac{1}{4}z^{-1})} \tag{1.0.1}$$

1) What is the region of covergence of H(z)?
2) Is the system stable ? Explain

2 SOLUTION

a) The above equation can be written as

$$H(z) = \frac{1 + z}{(z - \frac{1}{2})(z + \frac{1}{4})} \tag{2.0.1}$$

$$= \frac{2}{z - \frac{1}{2}} - \frac{1}{z + \frac{1}{4}} \tag{2.0.2}$$

$$= 4 \times \frac{\frac{1}{2}z^{-1}}{1 - \frac{1}{2}z^{-1}} + 4 \times \frac{-\frac{1}{4}z^{-1}}{1 - (-\frac{1}{4})z^{-1}} \tag{2.0.3}$$

ROC for first part is $| z | > | \frac{1}{2} |$. ROC for second part is $| z | > | \frac{1}{4} |$. The intersection gives the ROC which is The poles of the z-transform are given by $| z | > | \frac{1}{2} |$

$$z = \frac{1}{2}, -\frac{1}{4} \tag{2.0.4}$$

The zero of the z-transform is given by

$$z = -1 \tag{2.0.5}$$

b)By defintition a causal system is stable if and only if all the poles of the Z-transform of the impulse response of the system lie inside the unit circle. So,since ROC include $| z | = 1$ the system is **stable**.
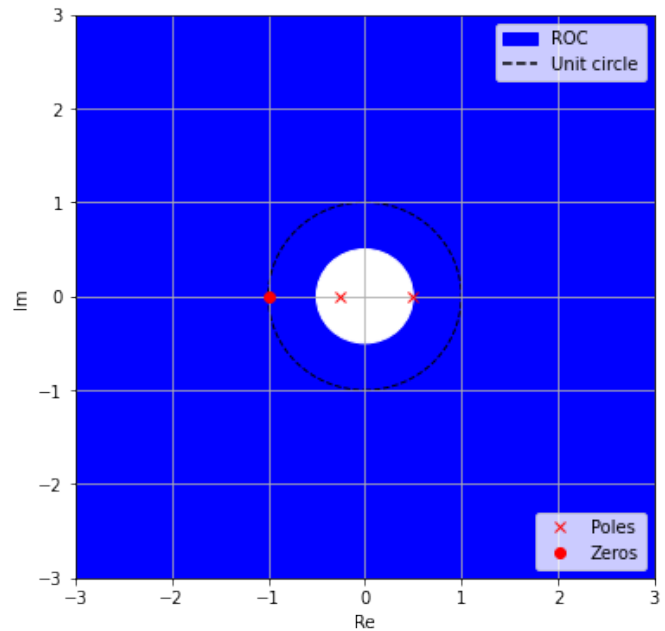

Fig. 1: Pole-zero plot of the system