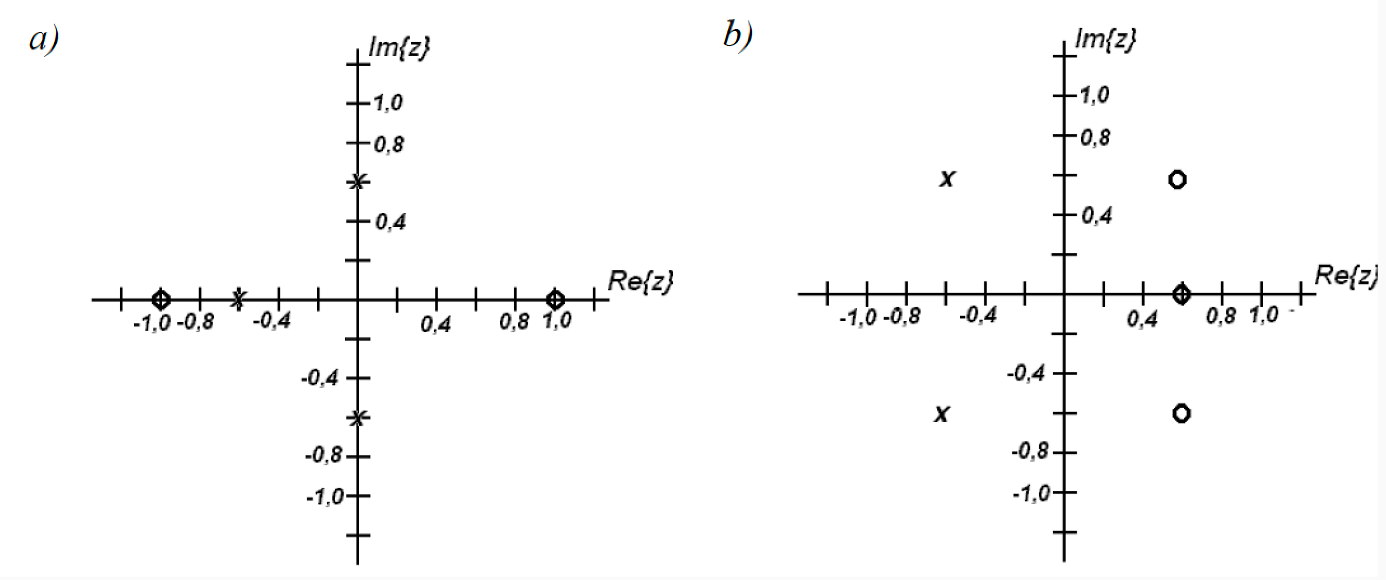
Question 12 – Knowing the position of poles and zeros of the inear shift-invariant systems, determine h[n] causal.



Step 1

The provided image illustrates the positions of poles and zeros for linear shift-invariant systems. To determine the causal impulse response, h[n], based on the poles and zeros of the system, follow these steps:

Explanation:

1. Identify the positions of the poles (indicated by the "x" symbols) and the zeros (indicated by the "○" symbols).

2. Use the positions to derive the system's transfer function, H(z).

3. Perform an inverse Z-transform on H(z) to obtain h[n].

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Step 2

For the system in part a):

Zeros:

- (z_1 = -0.8) (Real axis)

- (z_2 = -0.4 + 0.4j) (Complex conjugate)

- (z_3 = -0.4 - 0.4j) (Complex conjugate)

Poles:

- (p_1 = 0.8) (Real axis)

- (p_2 = 1.0) (Real axis)

Using the identified poles and zeros, the transfer function is given by:

$$\left[\mathrm{H(z)} = \mathrm{k} \frac{(\mathrm{z}+0.8)(\mathrm{z}+0.4-0.4\mathrm{j})(\mathrm{z}+0.4+0.4\mathrm{j})}{(\mathrm{z}-0.8)(\mathrm{z}-1.0)} \right]$$

To find h[n], perform an inverse Z-transform on H(z).

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Step 3

*For the system in part b)**:

Zeros:

- (z_1 = 0.8 + 0.4j) (Complex conjugate)

- (z_2 = 0.8 - 0.4j) (Complex conjugate)

Poles:

- (p_1 = -0.8) (Real axis)

- (p_2 = 1.0) (Real axis)

Using the identified poles and zeros, the transfer function is given by:

$$\left[\mathrm{H(z)} = \mathrm{k} \frac{(\mathrm{z}-0.8-0.4\mathrm{j})(\mathrm{z}-0.8+0.4\mathrm{j})}{(\mathrm{z}+0.8)(\mathrm{z}-1.0)} \right]$$

Again, to find h[n], perform an inverse Z-transform on H(z).

Explanation:

Note: The constant k in both transfer functions represents a scaling factor. It can be determined by setting z = 1 in H(z) if the system is stable and causal. In both cases, since all poles lie inside the unit circle, the systems are stable. If h[n] is causal, then all poles must be outside the unit circle, which is not the case here

Answer

Answer and explanation are given above