

FACULTY OF ENGINEERING, UNIVERSITY OF JAFFNA

DIGITAL SIGNAL PROCESSING – EC5011

LABORATORY SESSION 2 **DIGITAL SIGNAL PROCESSING THEORY AND APPLICATION**

PRELAB PREPARATION

1. All-pass Filter

1.1. What is All-pass filter?

Example transfer function of an all-pass filter:

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

1.2. Determine the magnitude response of the example filter.

1.3. Sketch the magnitude response.

1.4. Comment on the magnitude response.

1.5. Plot the pole-zero map.

1.6. Comment on the relative positions of poles and zeros.

2. Min phase filter, Max phase filter, Mixed phase filter.

2.1. What is meant by Min phase filter, Max phase filter and Mixed phase filter?

Example transfer functions for Min phase, Max phase and Mixed phase respectively.

$$H_1(z) = 12 + z^{-1} - 6z^{-2}$$

$$H_2(z) = 6 - z^{-1} - 12z^{-2}$$

$$H_3(z) = 8 - 6z^{-1} - 9z^{-2}$$

2.2. Plot the pole-zero map of each filter.

2.3. Comment on the relative positions of poles and zeros.

3. Linear Phase Filter.

3.1. What is “Linear Phase” Filter?

Example transfer function of a linear phase filter.

$$H(z) = 1 - z^{-2}$$

3.2. Determine and sketch the magnitude and phase response of the example filter.

3.3. Comment on magnitude and phase response.

3.4. Plot the pole-zero map of the example filter.

3.5. Comment on the relative positions of poles and zeros.

Reference: *Lecture notes of EC5011*

“Signal Processing and Linear Systems”, by B.P.Lathi