Lab-7

20171311

7.1 c) $H(z) = \frac{z - p^{-1}}{z - p}$ represents an all pass filters

$H(z) = \frac{z}{z - p}$, if p is +ve, it is high pass
if p is -ve, it is low pass

7.1 d) Two diff impulse responses are possible. Out of which one is causal and the other one is non causal
The one which was done in the lab was causal.

7.2 a) $H(z) = \frac{z}{z^2 - (2r\cos\theta)z + r^2}$

zeros = 0

poles : $z^2 - (2r\cos\theta)z + r^2 = 0$

$\Rightarrow \frac{2r\cos\theta \pm \sqrt{4r^2\cos^2\theta - 4r^2}}{2}$

$\Rightarrow r\cos\theta \pm ir\sin\theta$

(1.3) (a) $y[n] = 2.5\, y[n-1] - y[n-2] + x[n] - 5x[n-1]$
$+ 6x[n-2]$.

Applying Z-transform

$$Z(y[n-p]) = \sum_{n=-\infty}^{\infty} y[n-p] z^{-n}$$

$$= z^{-p} \sum y[n-p] \cdot z^{-(n-p)}$$

$$= z^{-p} Y(z).$$

$$Y(z) = 2.5 z^{-1} Y(z) - Y(z) \cdot z^{-2} + X(z) - 5z^{-1} X(z) + 6 z^{-2} X(z)$$

$$Y(1 - 2.5z^{-1} + z^{-2}) = X(1 - 5z^{-1} + 6z^{-2}).$$

$$\frac{Y}{X} = H = \frac{1 - 5z^{-1} + 6z^{-2}}{1 - 2.5z^{-1} + z^{-2}}$$

Zeroes :- $z = 2, z = 3$

Poles :- $z = 2, z = \frac{1}{2}$

$$H = \frac{(1-2z^{-1})(1-3z^{-1})}{(1-2z^{-1})(1-\frac{1}{2}z^{-1})} = \frac{1-3z^{-1}}{1-\frac{z^{-1}}{2}}$$

$$\frac{Y}{X} = \frac{1-3z^{-1}}{1-\frac{z^{-1}}{2}}$$

$$Y\left(1 - \frac{z^{-1}}{2}\right) = X(1 - 3z^{-1})$$

(7-3)(b) Applying inverse

$$y[n] - \frac{y[n-1]}{2} = x[n] - 3x[n-1]$$

This is the reduced eqn because of concatenation.

$$H = \frac{1 - 3z^{-1}}{1 - \frac{z^{-1}}{2}}$$

(7-3)(c)

$$H(z) = \frac{1}{1 - \frac{z^{-1}}{2}} - \frac{3z^{-1}}{1 - \frac{z^{-1}}{2}}$$

Inverse of this

$$h[n] = \left(\frac{1}{2}\right)^n u(n) - 3\left(\frac{1}{2}\right)^{n-1} u[n-1].$$

This is a causal system.

Scanned by CamScanner