

MAT 320

Quiz 3

Spring 2018

- Consider the digital filter F_1 : $y_t = x_t - \frac{1}{2}x_{t-1}$. What is the transfer function $\mathcal{H}(z)$ for this filter?
 - $1 - \frac{1}{2}z$
 - $1 - \frac{1}{2z}$
 - $z - \frac{1}{2}$
 - $\frac{z-2}{z}$
 - $1 - 2z$
 Correct Answer: $1 - \frac{1}{2z}$
- Same filter F_1 as in the previous question. What is the frequency response $H(\omega)$ of this filter?
 - $e^{i\omega} - \frac{1}{2}$
 - $1 - \frac{1}{2}e^{i\omega}$
 - $1 - \frac{1}{2}e^{-i\omega}$
 - $1 - 2e^{-i\omega}$
 - $\frac{e^{i\omega}-2}{e^{i\omega}}$
 Correct Answer: $1 - \frac{1}{2}e^{-i\omega}$
- Same filter F_1 as in the previous question. What is the magnitude response $|H(\omega)|$ of this filter?
 - $|e^{i\omega} - \frac{1}{2}|$
 - $|1 - \frac{1}{2}e^{i\omega}|$
 - $|1 - e^{-i\omega}|$
 - $|1 - 2e^{-i\omega}|$
 - $|\frac{e^{i\omega}-2}{e^{i\omega}}|$
 Correct Answer: $|e^{i\omega} - \frac{1}{2}|$
- Same filter F_1 as in the previous question. Which frequency ω has the largest frequency response?
 - $\pi/4$
 - $\pi/3$
 - $\pi/2$
 - $2\pi/3$
 - $3\pi/4$
 Correct Answer: $3\pi/4$
- Same filter F_1 as in the previous question. If the input \mathbf{x} is the unit impulse signal: $(1, 0, 0, 0, \dots)$ then what is the output value y_2 ? (Assume $x_{-1} = 0$.)
 - 1
 - $-\frac{1}{2}$
 - $1 - \frac{1}{2}$
 - 0
 - $\frac{1}{4}$
 Correct Answer: 0
- Consider the digital filter F_2 : $y_t = x_t + \frac{1}{2}y_{t-1}$. What is the transfer function $\mathcal{H}(z)$ for this filter?
 - $1 - \frac{1}{2}z$
 - $1 - \frac{1}{2z}$
 - $\frac{z}{z-\frac{1}{2}}$
 - $\frac{z-\frac{1}{2}}{z}$
 - $1 - 2z$
 Correct Answer: $\frac{z}{z-\frac{1}{2}}$
- Same filter F_2 as in the previous question. What is the frequency response $H(\omega)$ of this filter?
 - $\frac{e^{i\omega}}{e^{i\omega}-\frac{1}{2}}$
 - $1 - \frac{1}{2}e^{i\omega}$
 - $1 - \frac{1}{2}e^{-i\omega}$
 - $1 - 2e^{-i\omega}$
 - $\frac{e^{i\omega}-2}{e^{i\omega}}$
 Correct Answer: $\frac{e^{i\omega}}{e^{i\omega}-\frac{1}{2}}$
- Same filter F_2 as in the previous question. What is the magnitude response $|H(\omega)|$ of this filter?
 - $\frac{1}{|e^{i\omega}-\frac{1}{2}|}$
 - $|1 - \frac{1}{2}e^{i\omega}|$
 - $|1 - e^{-i\omega}|$
 - $|1 - 2e^{-i\omega}|$
 - $|\frac{e^{i\omega}-2}{e^{i\omega}}|$
 Correct Answer: $\frac{1}{|e^{i\omega}-\frac{1}{2}|}$
- Same filter F_2 as in the previous question. Which frequency ω has the largest frequency response?
 - $\pi/4$
 - $\pi/3$
 - $\pi/2$
 - $2\pi/3$
 - $3\pi/4$
 Correct Answer: $\pi/4$
- Same filter F_2 as in the previous question. If the input \mathbf{x} is the unit impulse signal: $(1, 0, 0, 0, \dots)$ then what is the output value y_2 ? (Assume $y_{-1} = 0$.)
 - 1
 - $\frac{1}{2}$
 - $1 + \frac{1}{2}$
 - $1 + \frac{1}{2} + \frac{1}{4}$
 - $\frac{1}{4}$
 Correct Answer: $\frac{1}{4}$