

HW8Q74 Prob 3.39.

Consider a DT LTI sys w. freq response $H(e^{j\omega}) = \sum_{n=-\infty}^{\infty} h[n] e^{-j\omega n}$

$$= \begin{cases} 1 & \text{if } |\omega| \leq \frac{\pi}{8} \\ 0 & \text{if } \frac{\pi}{8} < |\omega| < \pi \end{cases}$$

Q: If $x[n]$ has period 3, then $y[n]$

has only 1 non-zero FS coeff b_k

Ans: $x[n] = \sum_{k=0}^2 a_k e^{+jk \frac{2\pi}{3} n}$

$y[n] = \sum_{k=0}^2 b_k e^{+jk \frac{2\pi}{3} n}$

$b_k = a_k \cdot H(e^{jk \frac{2\pi}{3}})$

when $k=0$. $b_0 = a_0 \cdot H(e^{j0 \frac{2\pi}{3}}) = a_0$

$k=1$ $b_1 = a_1 \cdot H(e^{j1 \cdot \frac{2\pi}{3}}) = a_1 \cdot 0 = 0$

$k=2$ $b_2 = a_2 \cdot H(e^{j2 \cdot \frac{2\pi}{3}})$
 $= a_2 \cdot H(e^{j(-1) \cdot \frac{2\pi}{3}}) = a_2 \cdot 0 = 0$

$\Rightarrow y[n] = a_0$

is a constant

