100

QUIZ
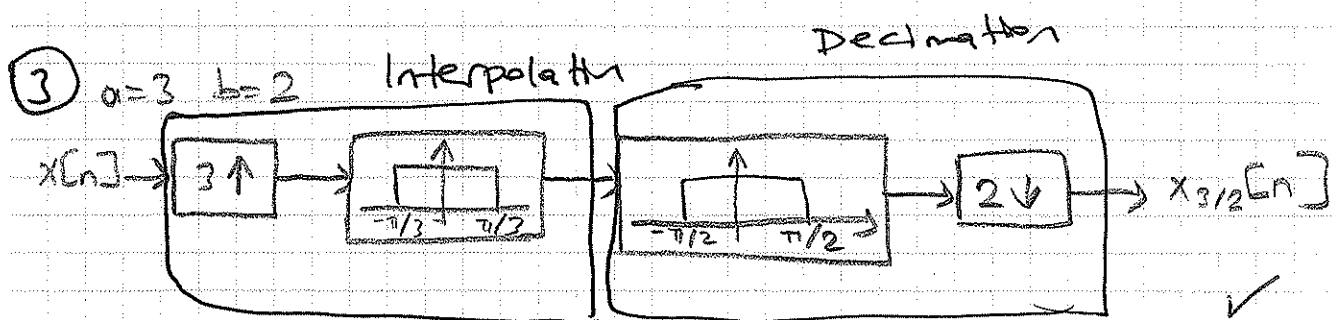
① Let $x(t)$ be a cont.-time signal (bandlimited), with max. angular frequency $\Omega_0 = 2\pi \cdot 2k$ Hz. What is the minimum sampling freq. Ω_s which enables a reconstruction of $x(t)$ from its samples $x[n]$?

② Let $h[n] = \left\{ \dfrac{1}{4}, \underset{\underset{n=0}{\downarrow}}{\dfrac{1}{2}}, \dfrac{1}{4} \right\}$. Compute the DTFT $H(e^{j\omega})$.

③ Plot the diagram of the system which rescales a seq. by $\dfrac{3}{2}$

ANSWERS

① $\Omega_s > 2\Omega_0 \implies \Omega_s \geq 2 \cdot 2\pi \cdot 2 kHz \implies \Omega_s \geq 8\pi \, kHz$

Therefore, the minimum sampling freq is

$\Omega_s = 8\pi \, kHz$ ✓

② $H(e^{j\omega}) = \sum_{n=-1}^{1} h[n] e^{-j\omega n} = \dfrac{1}{4} \cdot e^{j\omega} + \dfrac{1}{2} + \dfrac{1}{4} e^{-j\omega}$ ✓

$H(e^{j\omega}) = \dfrac{1}{2} + \dfrac{1}{2} \cos \omega$

③ $a=3$ $b=2$

Interpolation   Decimation

$x[n] \rightarrow \boxed{3\uparrow} \rightarrow \boxed{\text{(LPF } -\pi/3 \text{ to } \pi/3)} \rightarrow \boxed{\text{(LPF } -\pi/2 \text{ to } \pi/2)} \rightarrow \boxed{2\downarrow} \rightarrow x_{3/2}[n]$ ✓

$\dfrac{\pi}{3} < \dfrac{\pi}{2} \implies$ cut off$= \dfrac{\pi}{3}$

$x[n] \rightarrow \boxed{3\uparrow} \rightarrow \boxed{\text{(LPF } -\pi/3 \text{ to } \pi/3)} \rightarrow \boxed{2\downarrow} \rightarrow x_3[n]$