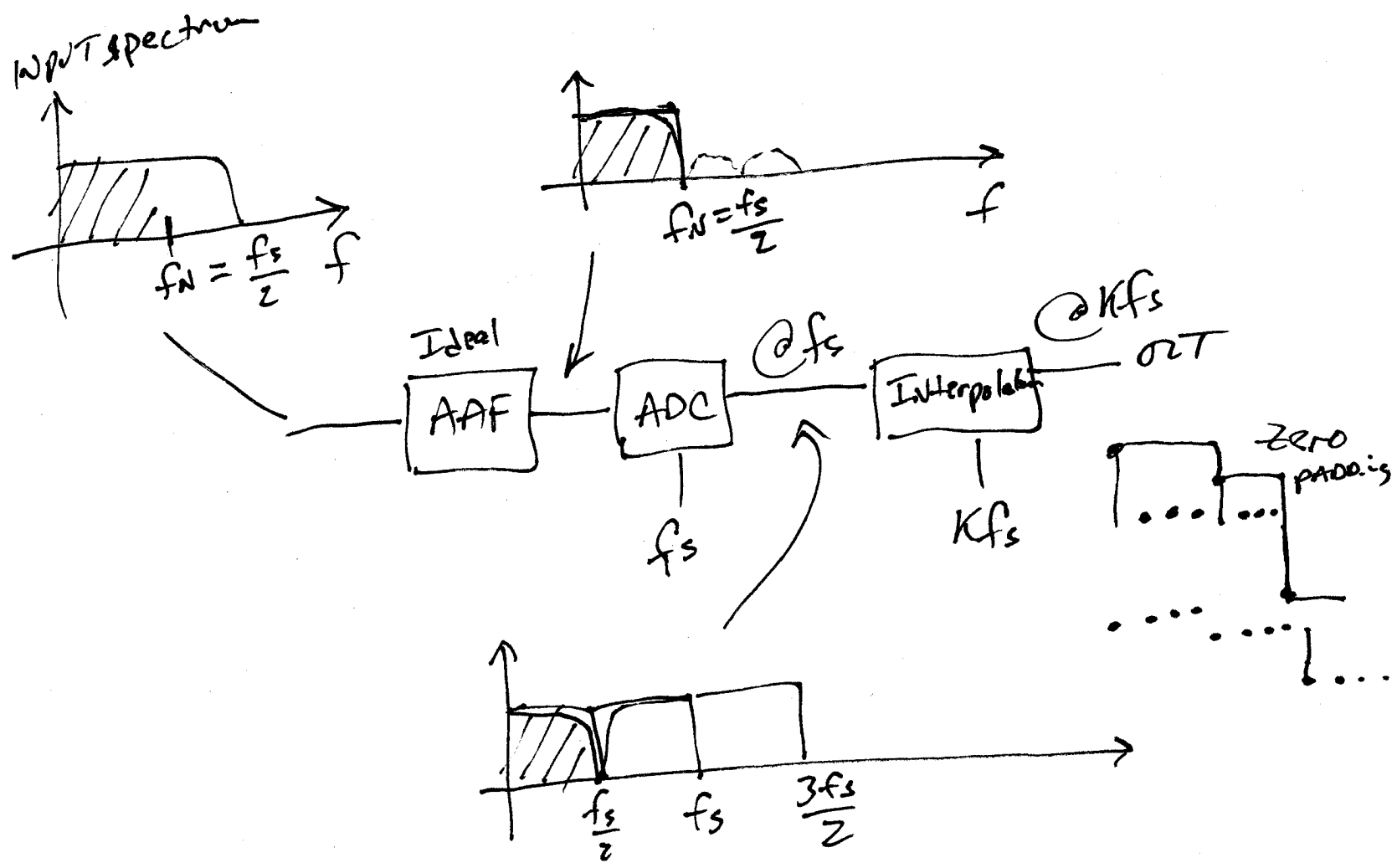
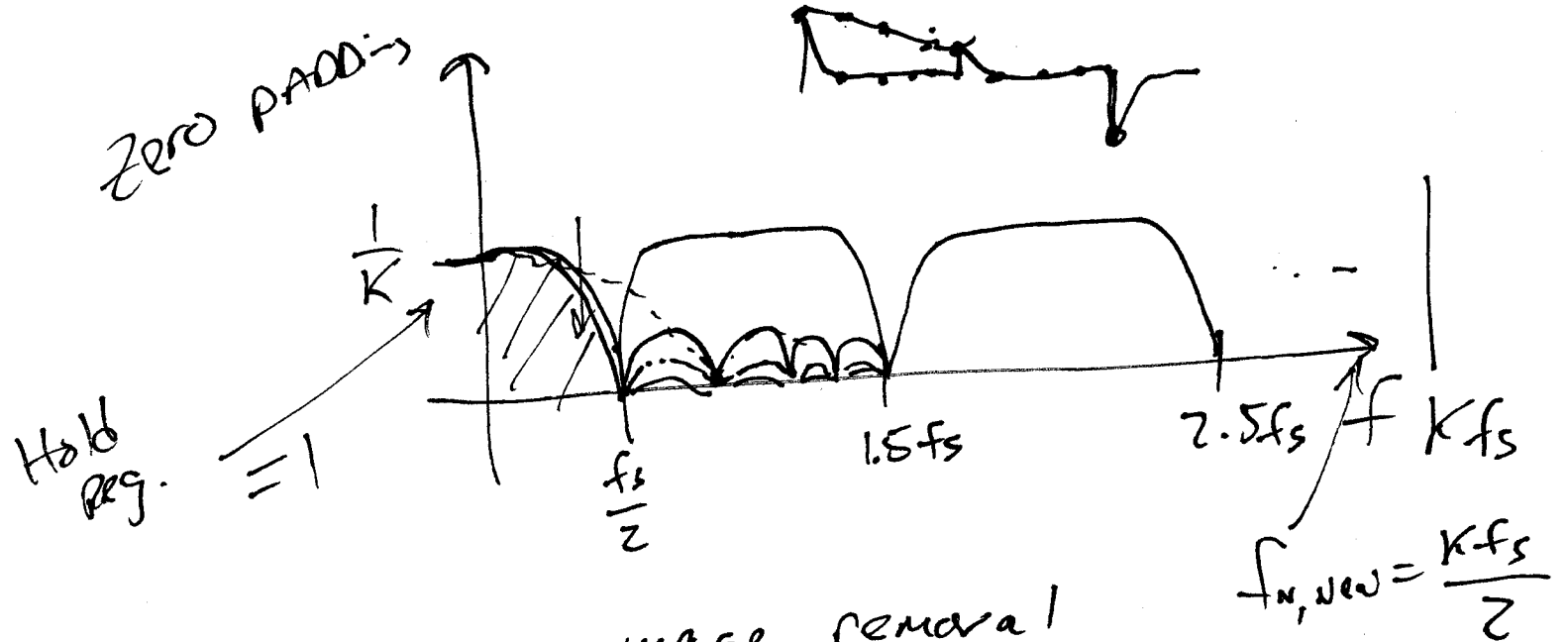


Lecture 9 Interpolation using sinc filters



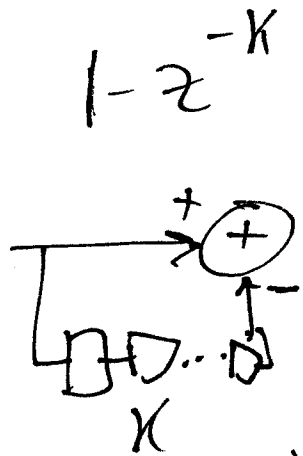
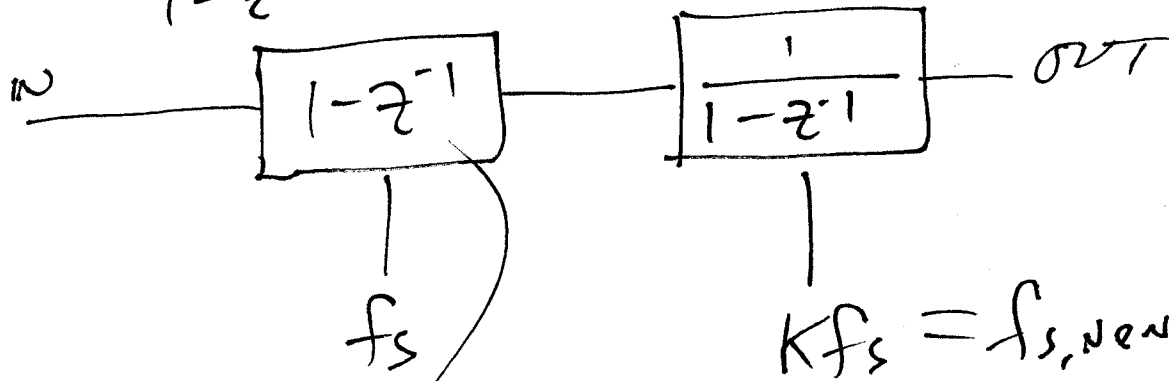
1)



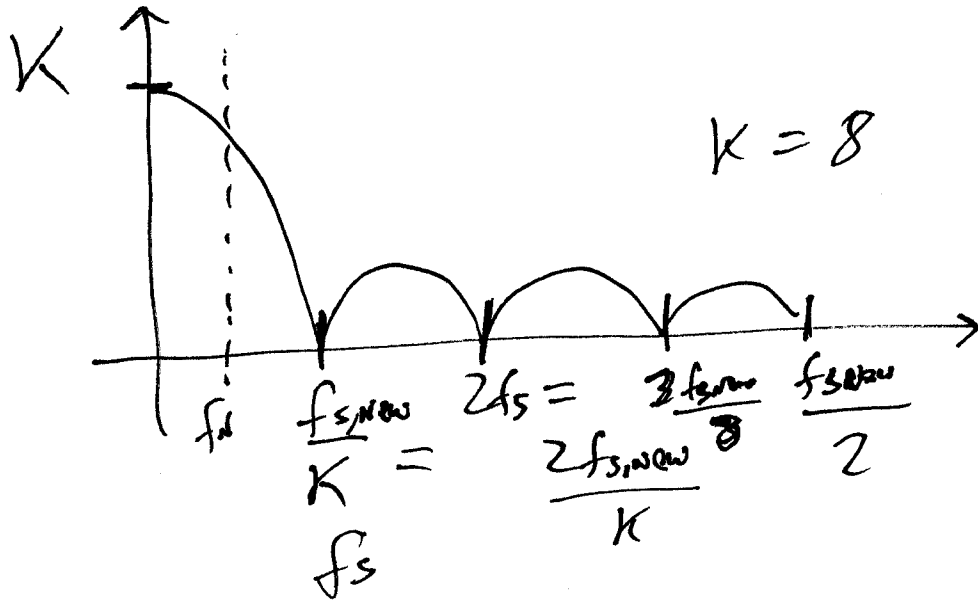
Implement a image removal filter
using sinc filters

$$\left[\frac{1-z^{-k}}{1-z^{-1}} \right]^L$$

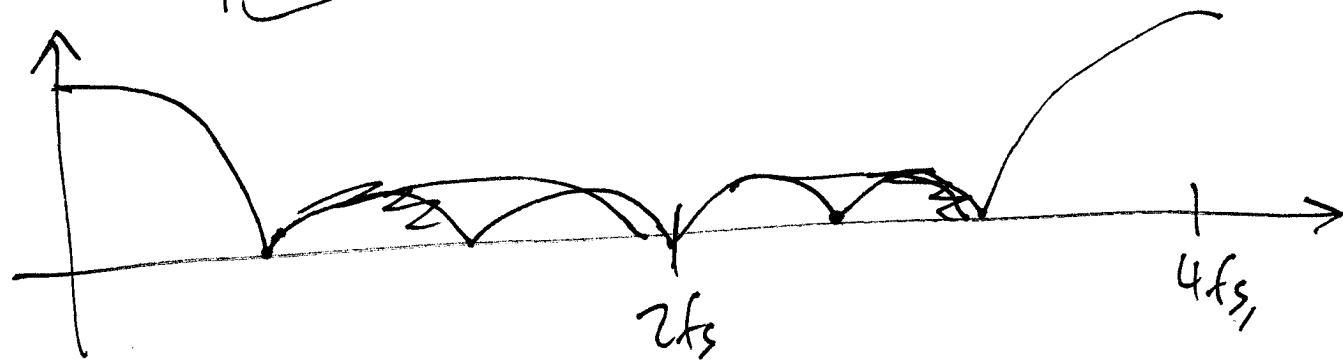
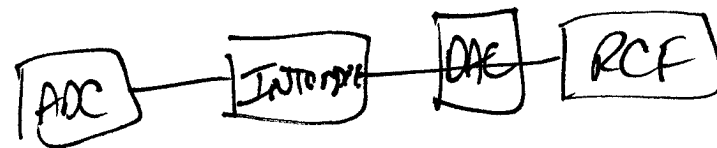
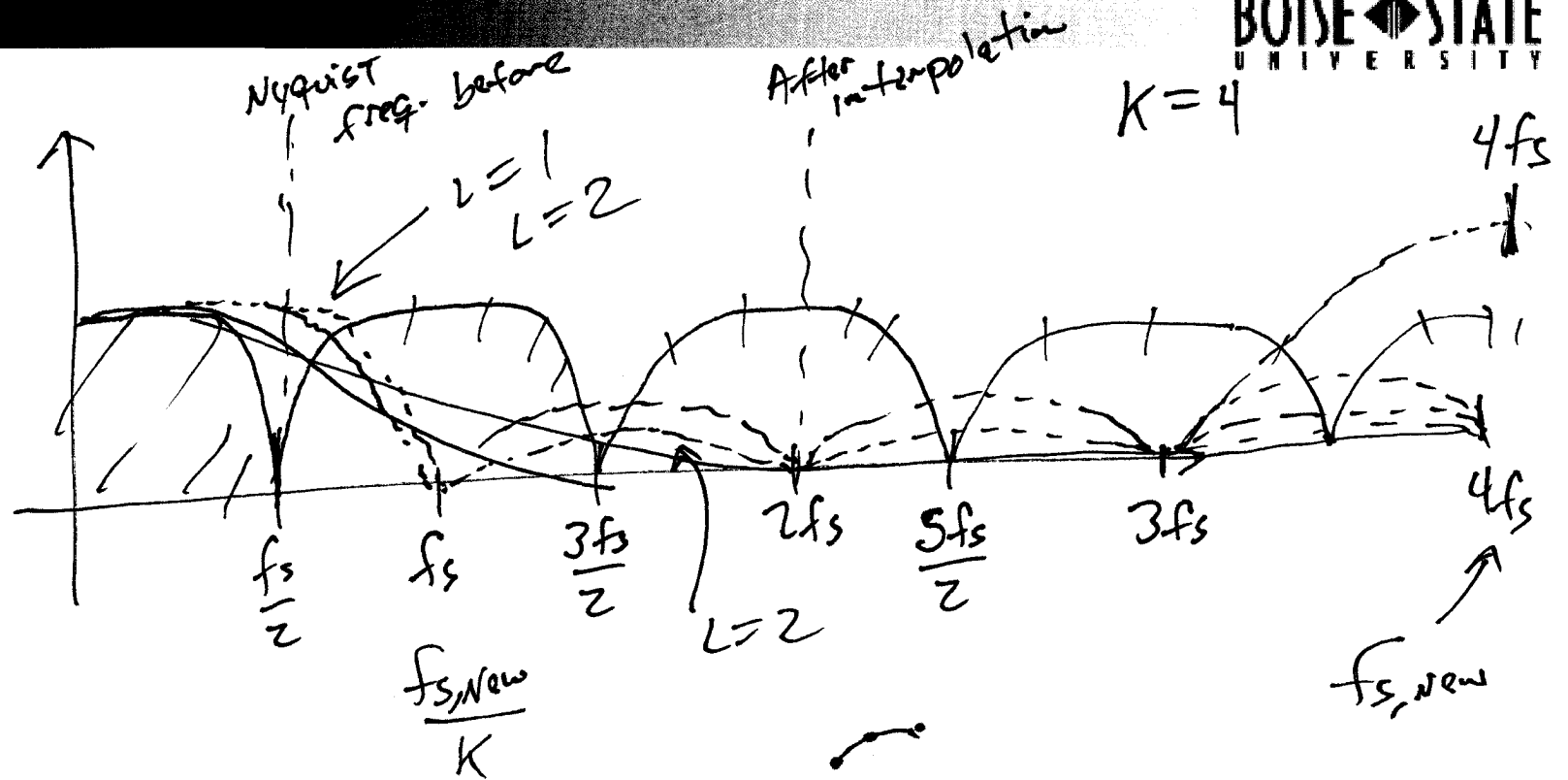
$$\frac{1 - z^{-k}}{1 - z^{-1}} @ k f_s$$



delay element \rightarrow ~~$k \cdot \frac{1}{f_s \cdot \text{new}}$~~ $k \cdot \frac{1}{f_s \cdot \text{new}} = \frac{1}{f_s}$



3)



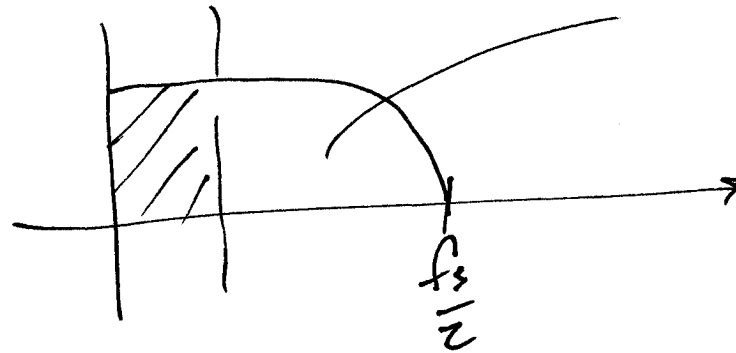
4)

DAC



f_s
 Kf_s

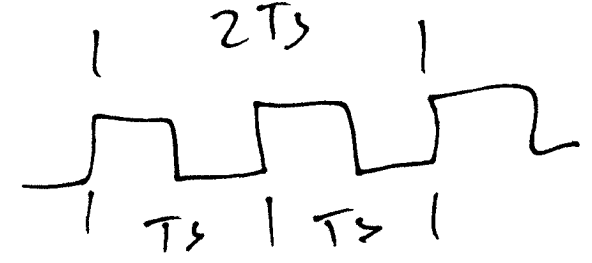
Decimation using sinc filters



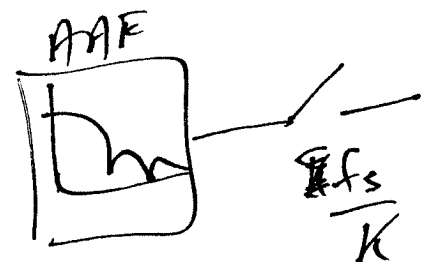
5)

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

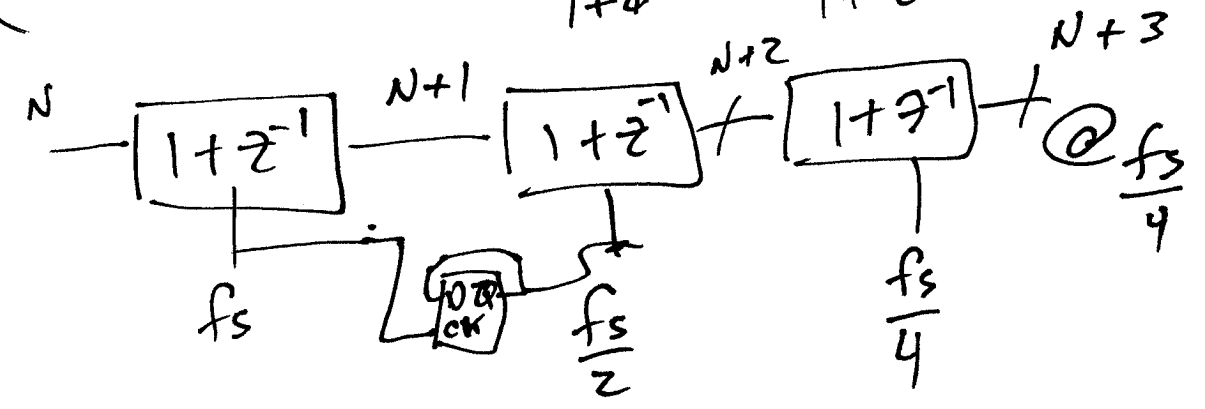
$$= \frac{1}{2^{k/2}} = (1 + z^{-1})(1 + z^{-2}) \cdot (1 + z^{-4}) + \dots (1 + z^{-2^{\log_2 k}})$$



$\log_2 k$ k has to be a power of two
 $\log_2 8 = 3$ $\log_2 k - 1 = 2$



$$(1 + z^{-1})(1 + z^{-2})(1 + z^{-4})$$



b)

$$(1+z^{-1})(1+z^{-2})(1+z^{-4})$$

$$(1+z^{-1}+z^{-2}+z^{-3})(1+z^{-4})$$

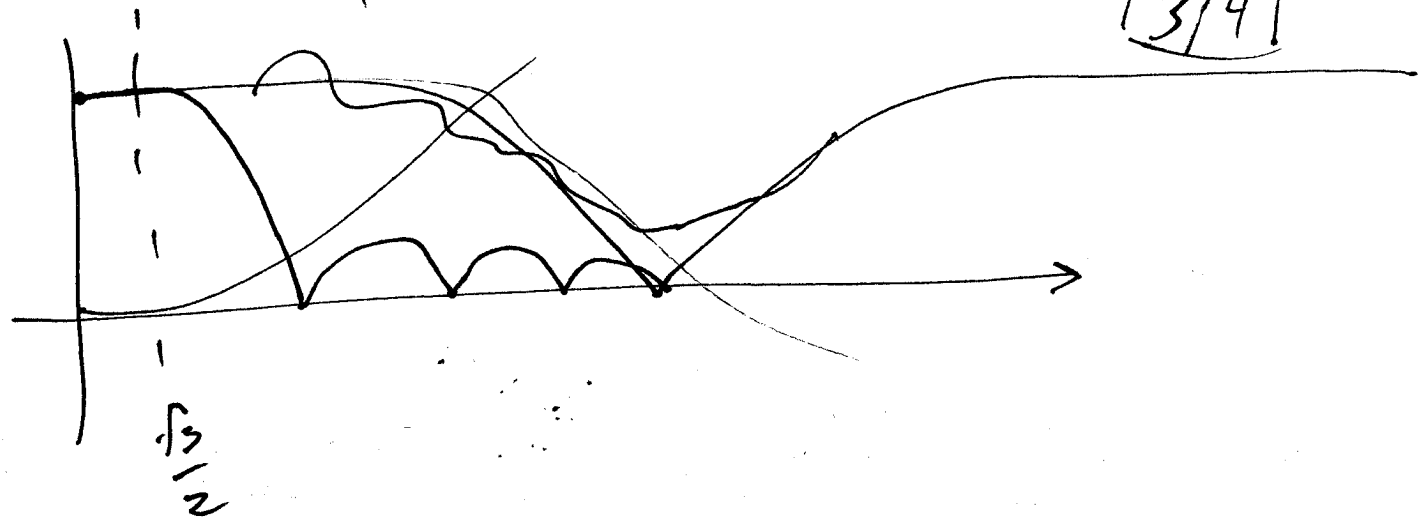
$$1+z^{-1}+z^{-2}+z^{-3}+z^{-4}+z^{-5}+z^{-6}+z^{-7}$$

$$\frac{1-z^{-8}}{1-z^{-1}}$$

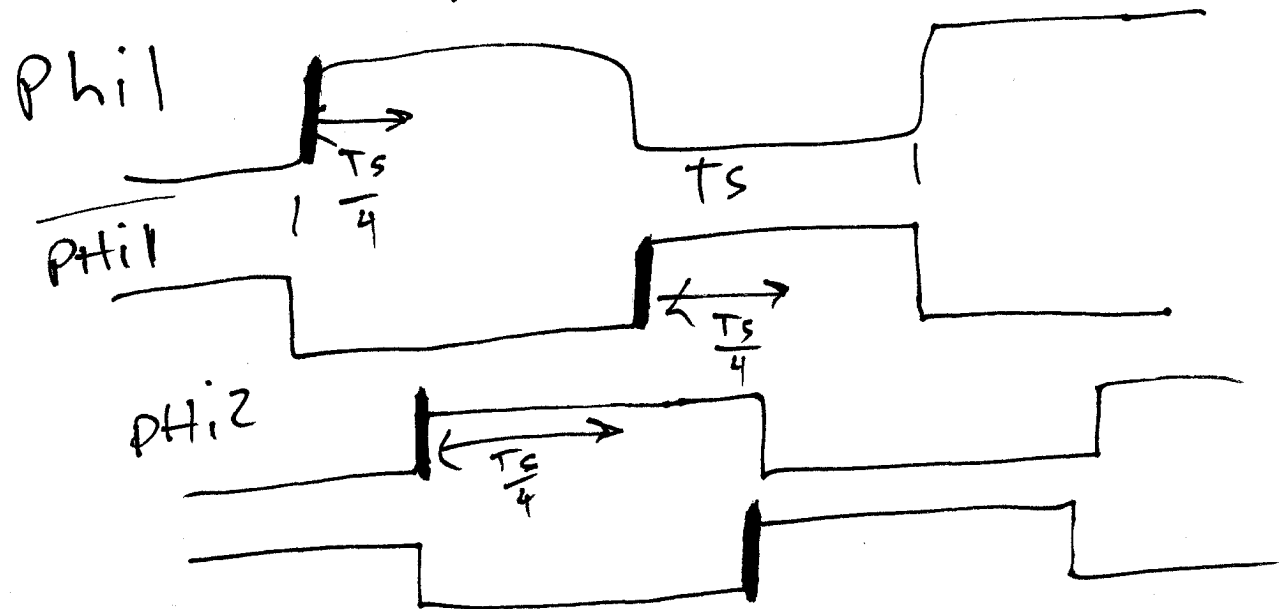
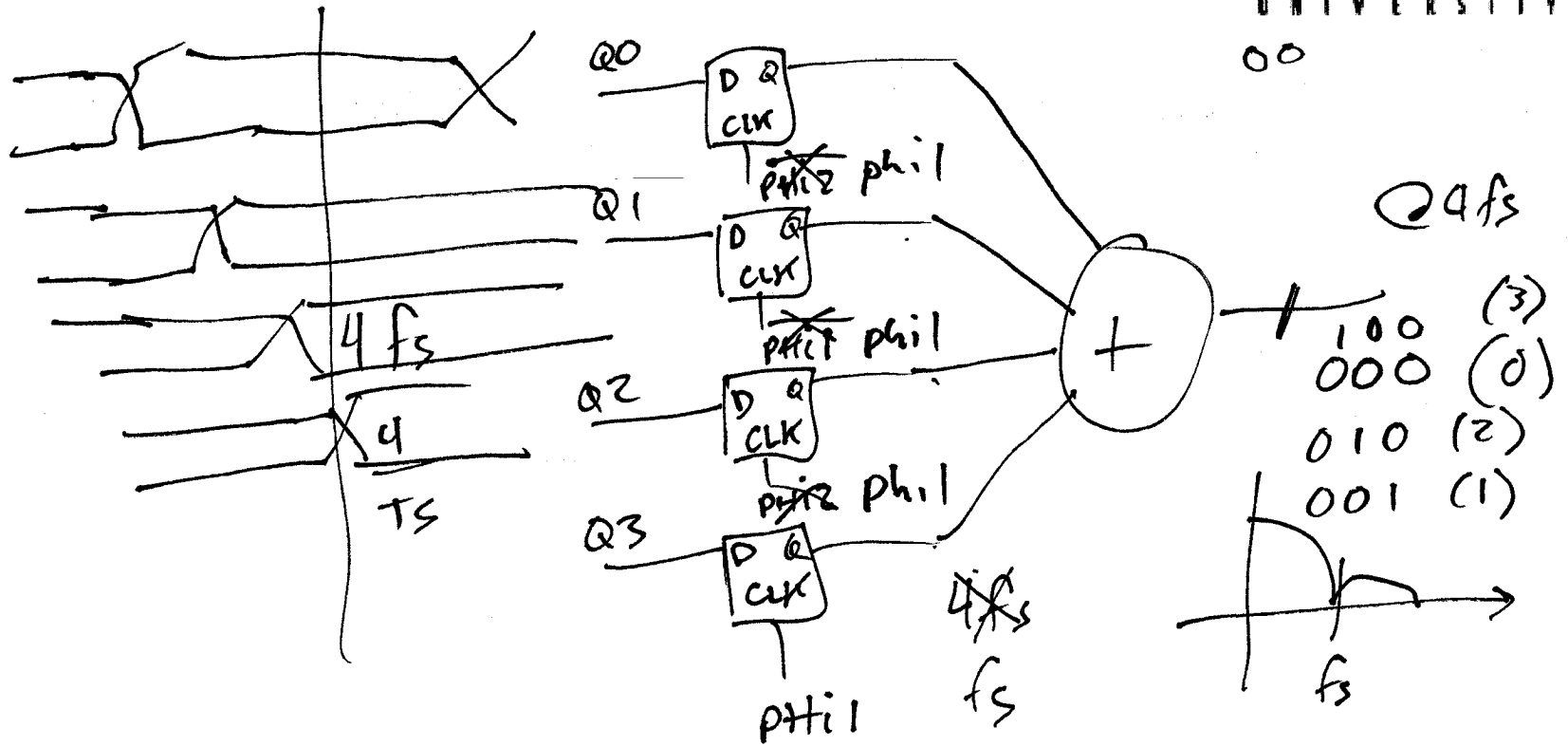
Arc

Decimation
digital filtering
Interpolation

3/4



1)



8)