A

0.1

With an OSR of 64 and a sampling frequency of 32MHz, what is the signal bandwidth?

0.2

Given a uniform probability distribution between $\frac{-V_{LSB}}{2}$ and $\frac{V_{LSB}}{2}$ what is the power of quantisation noise in a standard quantiser?

$$P = \int_{\frac{-V_{LSB}}{2}}^{\frac{V_{LSB}}{2}} \rho V^2 dV \tag{1}$$

0.3

What is the expression defining the noise power on a capacitor in a switched capacitor circuit?

0.4

If a quantiser rises at the midpoint of it's transfer function what kind of quantiser is it?

0.5

How can a quantiser be represented?

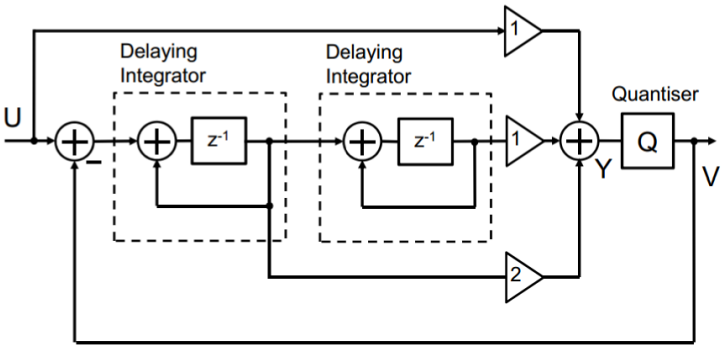

Figure 1: A Silva-Steensgard second order modulator diagram.

1

1.1

Derive the STF and NTF for the modulator shown in figure 1.

1.2

What is the expression describing the quantisation noise power in this modulator?

1.3

With a signal amplitude of M, what is the expected SQNR of this modulator?

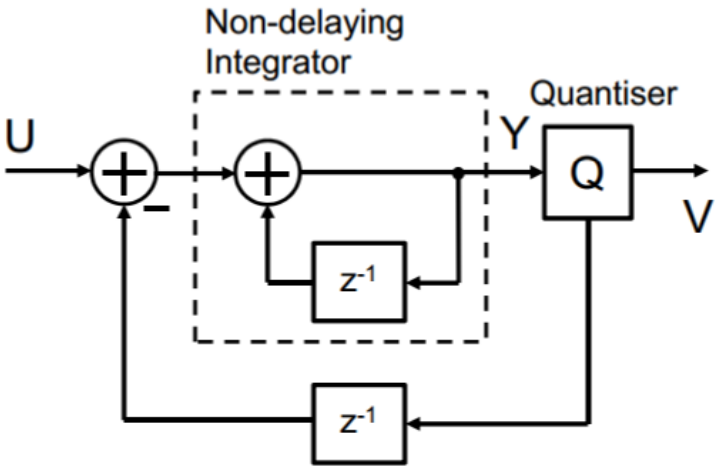

Figure 2: A first order modulator diagram.

2

2.1

Express the modulator shown in figure 2 in terms of time difference equations.

2.2

What is the period of the tone produced by a DC input of $\frac{2}{5}$? How many 1s and how many 0s does it contain?

2.3

Sketch a magnitude DFT of the tone in section 2.2.

2.4

If there were a 4 bit DWA DAC applied in this design with poorly matched components, what would you expected the period of the tones produced by it to be?

3

$$\text{SQNR} = 6.02N + (20L + 10)\log_{10}(OSR) - 10\log_{10}\left(\frac{\pi^{2L}}{2L+1}\right) \tag{2}$$

3.1

Calculate the expected SQNR for a 3rd order modulator with an OSR of 64 and a 3-bit quantiser.

3.1.1

Therefore, what is the expected ENOB?

3.2

If the quantiser has a 1V full-scale signal amplitude what is the baseband noise voltage?

3.3

If the total noise contributions due to thermal noise sources equal $0.8\mu V$ RMS, and the signal amplitude of this circuit is 1V:

3.3.1

Is quantisation or thermal noise dominant?

3.3.2

What is the expected SNDR of the circuit, ignoring any other noise sources?