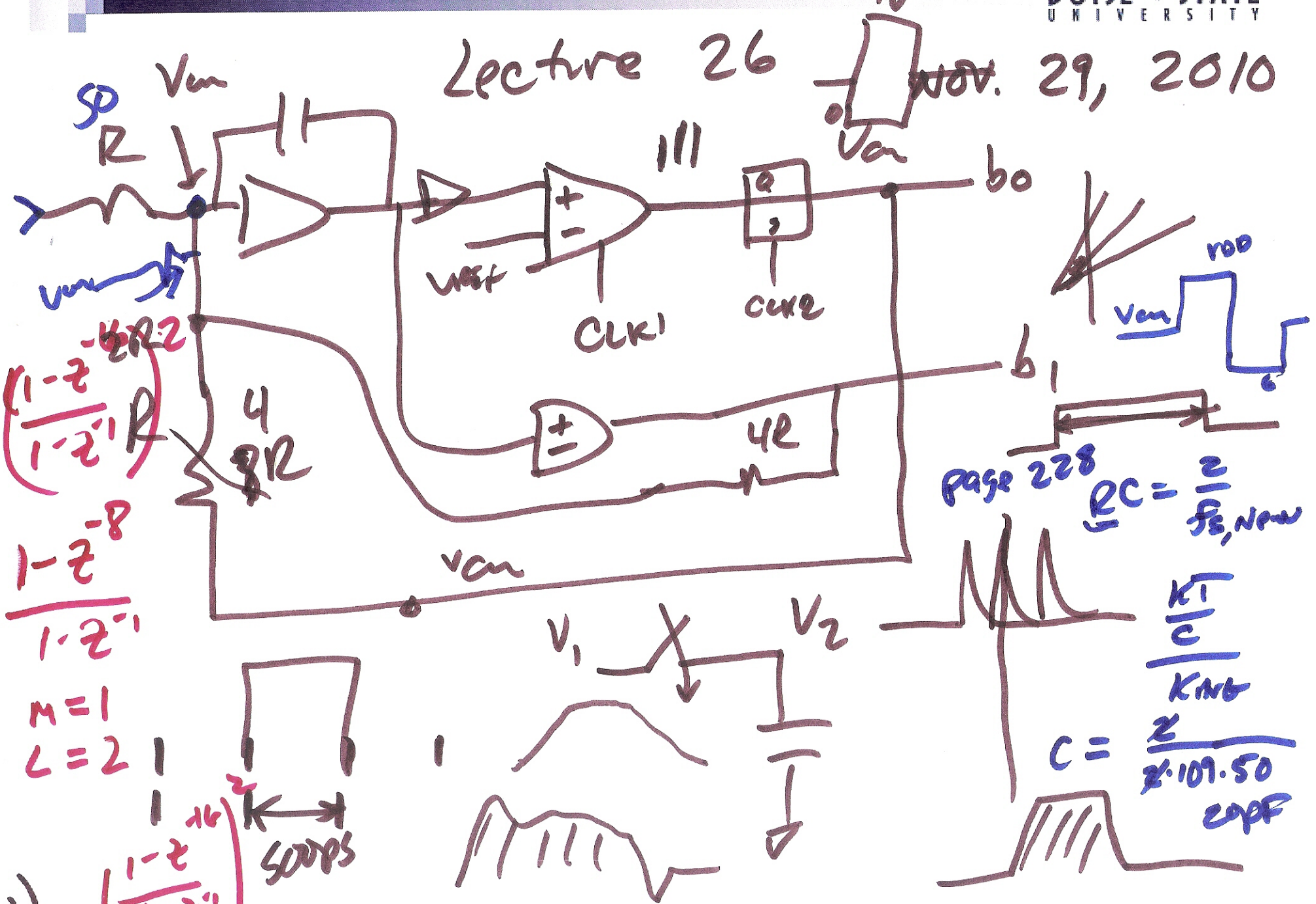
ECE 615 CMOS mixed-signal circuit Design

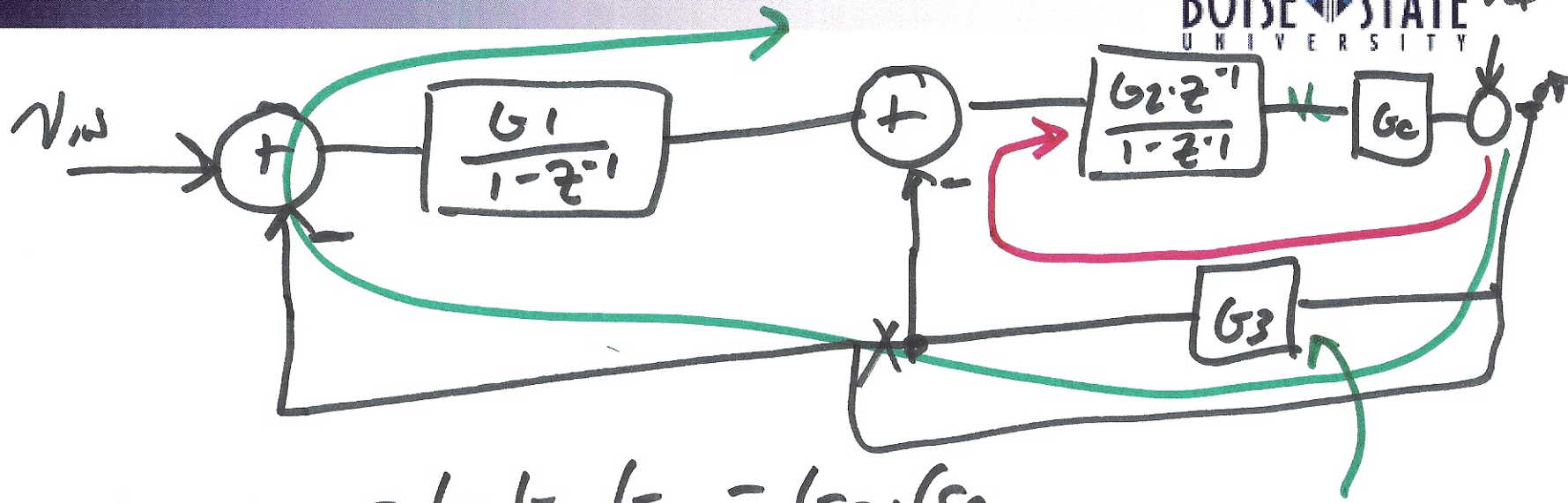
BOISE STATE UNIVERSITY

Lecture 26

Nov. 29, 2010



Second-order Modulator gain



$$1 = G_F = G_1 G_2 G_C = G_I \cdot G_C$$

$$0 \le G_F \le 1.333$$

(7.59) $$z_{p1,p2} = (1-G_F) \pm \sqrt{(1-G_F)^2 - (1-G_F)}$$

$$\frac{1}{z} = z^{-1} \qquad G_F = 1 \qquad z_{p1,p2} = 0$$

with G_3 Eq. (7.62)

$$z_{p1,p2} = \frac{2 - G_1G_2G_c - G_2G_3G_3}{2} - \frac{G_2G_3G_c}{2}$$

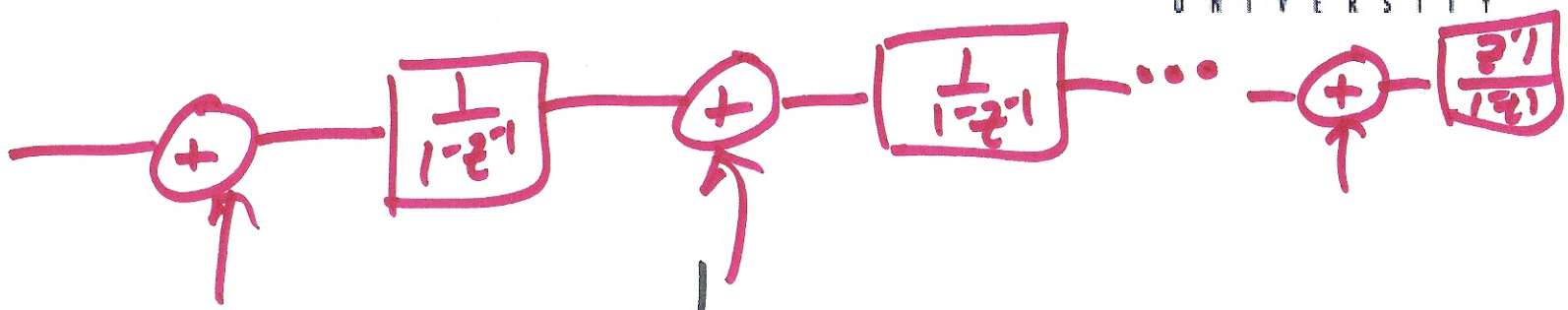
$$\pm \frac{\sqrt{(2 - G_1G_2G_c - G_2G_3G_c)^2 - 4(1 - G_2G_3G_c)}}{2}$$

$$\frac{G_1G_2G_c}{(z - z_{p1})(z - z_{p2})} = 1$$

$$G_1 = G_2 = G_3 = 0.4$$

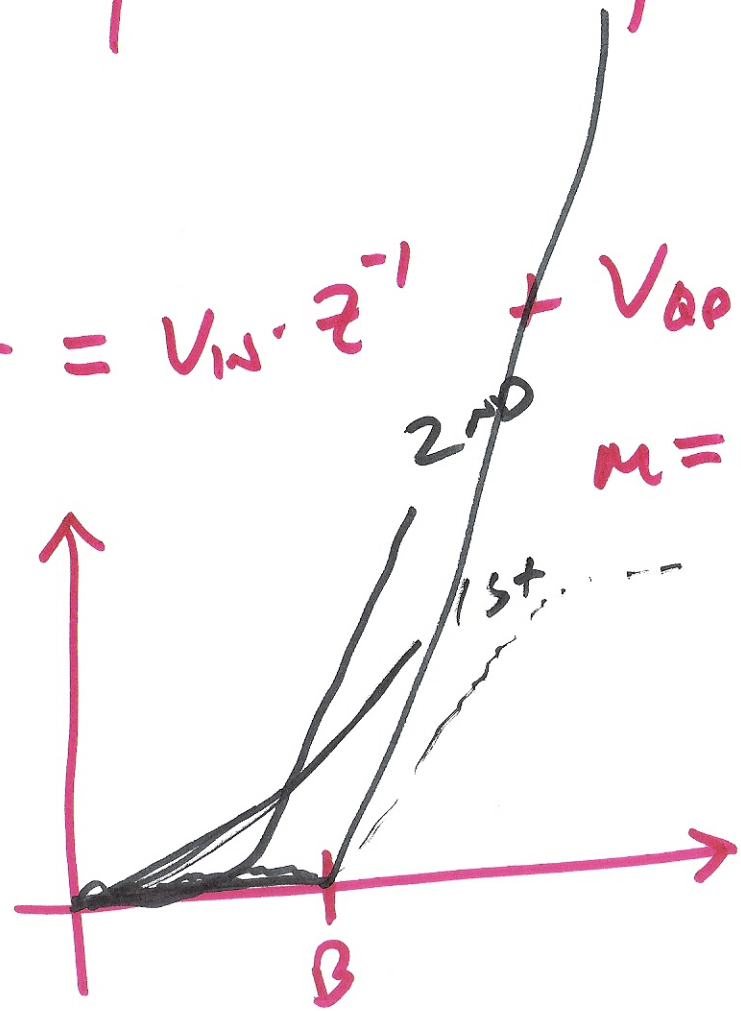
3)

Higher_Order Modulators

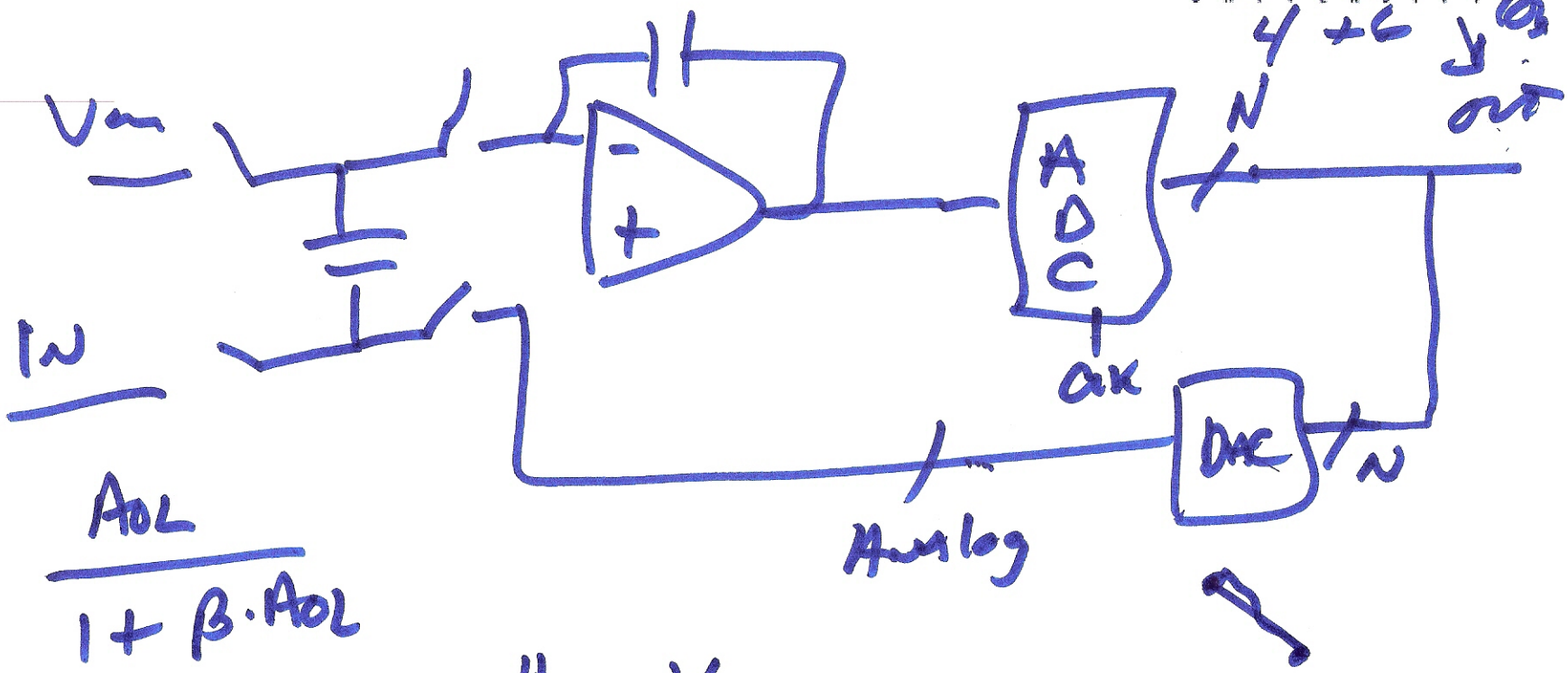


$$V_{OUT} = V_{IN} \cdot z^{-1} + V_{QE} (1 - z^{-1})^n$$

n = order of modulator



Multi-bit modulators

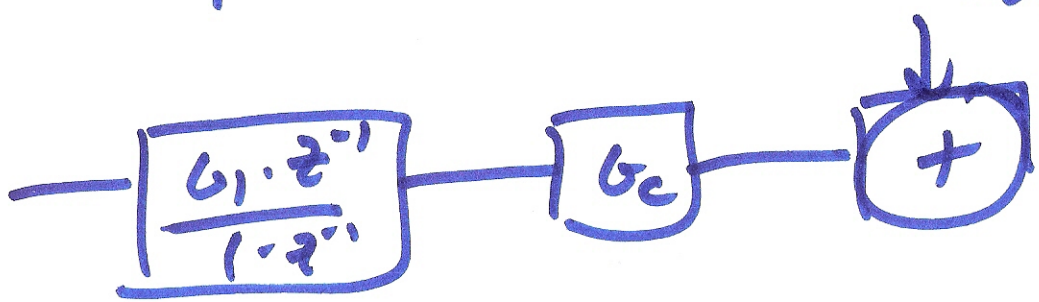


$$\frac{A_{OL}}{1+\beta \cdot A_{OL}}$$

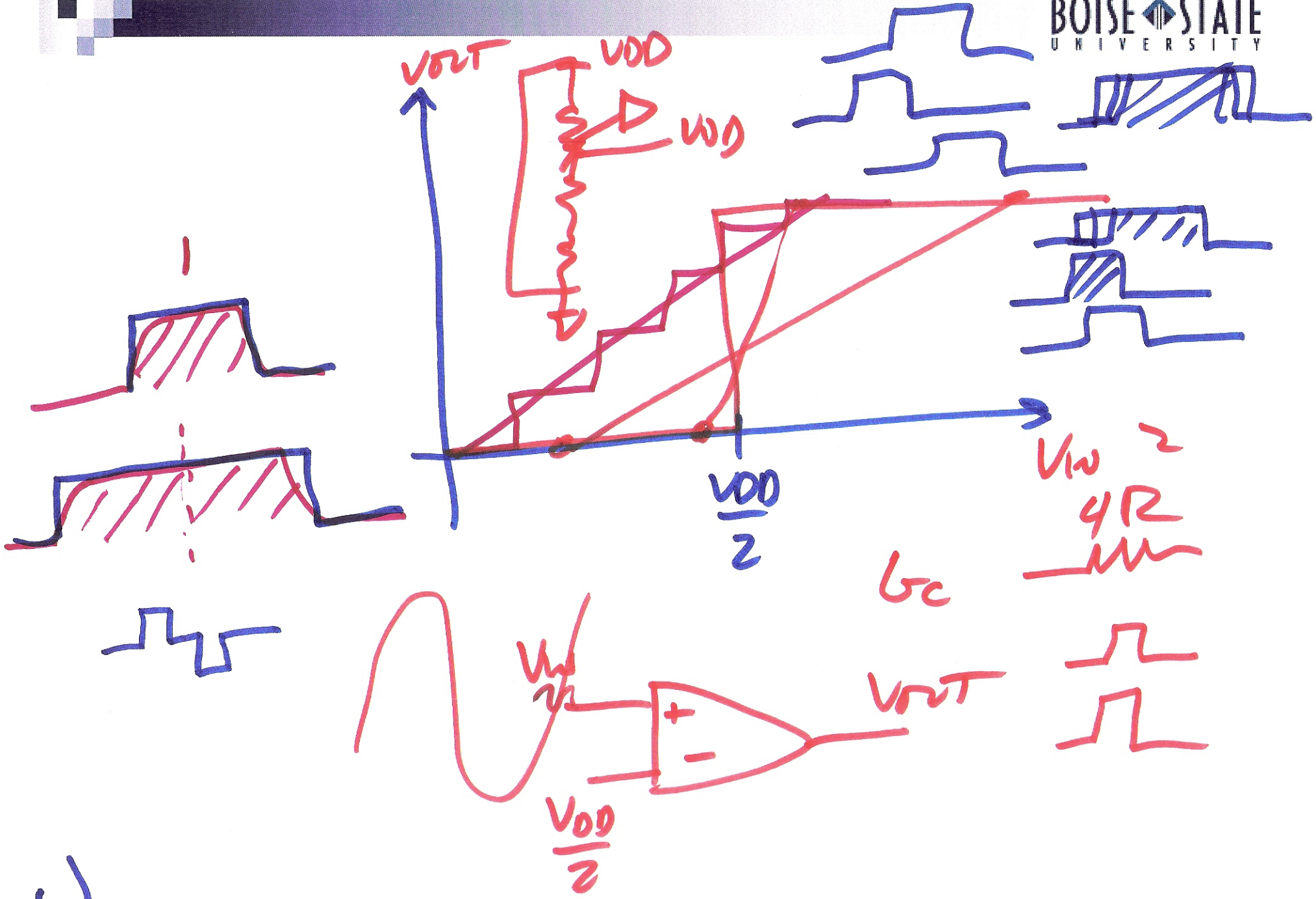
$$\frac{1}{\frac{1}{A_{OL}}+\beta}$$

$2^4 = 16$

4 · 1.5 bits = 6 bits



5)



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