1) Weighted Summer

$V_0 = -8 v_1 - 5 v_2 \quad R_F = 200\,k\Omega$

$\frac{R_F}{R_1} = 8 \qquad \frac{R_F}{R_2} = 5 \qquad \frac{200}{R_1} = 8 \qquad \frac{200}{R_2} = 5$

$R_1 = \frac{200}{8} \quad R_1 = 25\,k\Omega$

$R_2 = \frac{200}{5} = 40k\,\Omega$

2) Zener Diode

$V_t = 3.2v$ $I_z = 1.1mA$ $V_{z0} = 3.16v$

$r_z = ?$

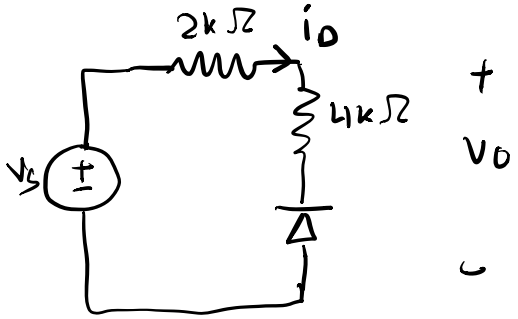
eq 1.1

$3.2 = 3.16 + (1.1E-3)(r_z)$

$.04 = (.0011)(r_z)$ $r_z = 36.36$

3) Ideal Diode

V_S, $V_O = V_S$



$V_O = I \times R$

$V_S = 10$

$i_D = \frac{10}{2E3}$ $\quad i_D = .005A$ $\quad V_O = 4k\Omega \times I_D$ → Does not make sense for it to be greater than 10... Something else.

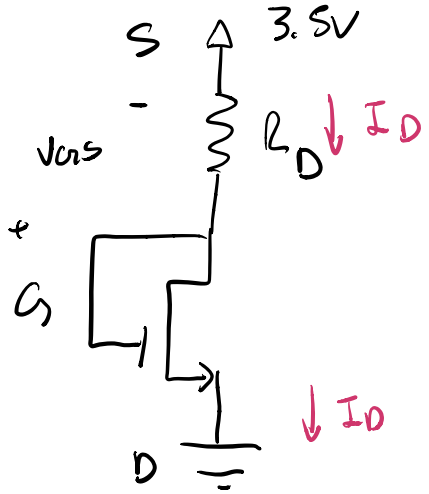
$V_O = 20v$

Or $V_O = \frac{4k\Omega}{6k\Omega} \cdot 10 = 6.67\ v$. Something else!

Could also be -6.67

4) $k'_n = .8\,mA/V^2$ $V_t = .75V$ $\frac{W}{L} = 2$

$V = 3.5$ $i_D = 2mA$



$V = IR$

$R_D = \frac{V}{I} = \frac{3.5}{2mA}$

$I_D = \frac{1}{2} k'_n \frac{W}{L} (V_{GS} - V_t)^2$

$2mA = \frac{1}{2}(.8)(2)(V_{GS} - .75)^2$

$2.5 = (V_{GS} - .75)^2$

$1.58 = V_{GS} - .75$

$\boxed{V_G = 2.33V}$

$V_{DS} = V_{GS} - V_t$

$V_{DS} = 2.33 - .75$

$\boxed{V_{DS} = 1.58V}$

5) $\beta = 200$

$I_{CQ} = 0.8mA$

$V_A = 80$

$$g_m = \frac{I_{CQ}}{V_T} = \frac{.8mA}{.025} = 32mA/V$$

$$r_\pi = \frac{\beta}{32} = \frac{200}{32} = 6.25$$

$$r_o = \frac{V_A}{I_{CQ}} = \frac{80}{.8mA} = 100k\Omega$$

6)

50 V/V

$R_4 = 100k\Omega$

$R_3 = 30k\Omega$

$R_1 = 10k\Omega$

$R_2 = ?$

$\left(\frac{106}{30}\right) 50 V/V = \left(1 + \frac{2R_2}{20k\Omega}\right)\left(\frac{100}{30}\right)\left(\frac{106}{30}\right)$

(20) $166.67 = 1 + \frac{2R_2}{20}$

$-1 \quad -1$

$\frac{(20)\,165.67}{2} = R_2 \qquad R_2 = 1656.67$