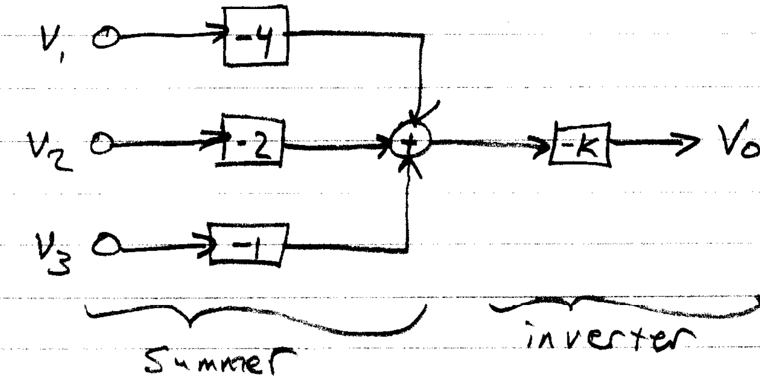
4-41) basic set-up:

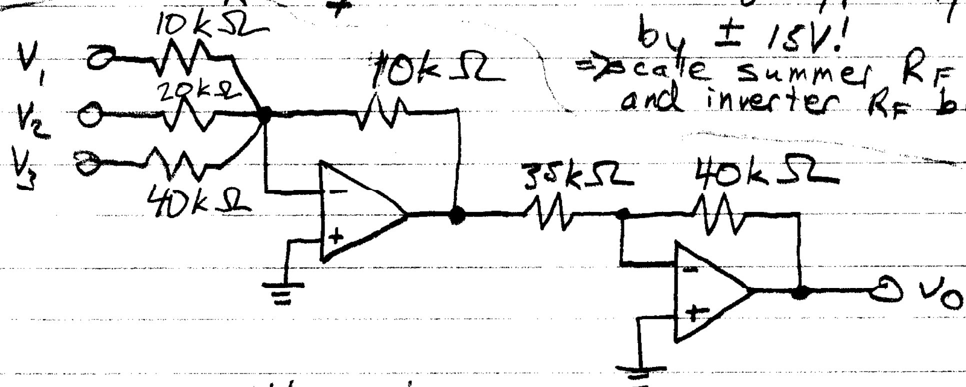



want max $V_o = 10V \Rightarrow$ occurs when all $v_{in} = 5V$

$$10V = K(4\cdot 5V + 2\cdot 5V + 5V)$$
$$= K(20V + 10V + 5V)$$
$$= K(35V)$$
$$K = \frac{2}{7}$$

→ but $v_o$ typically bounded by ± 15V!

⇒ scale summer $R_F$ by $\frac{1}{4}$ and inverter $R_F$ by 4




many possible solutions...

4-45) non-inverting Amp

for both open, $R_o, R_1, R_2$ in series, and

$$K = 10 = \frac{R_o + R_1 + R_2 + R_3}{R_3}$$

for lower switch (actual S2) closed, $R_2$ shorted, and

$$K = 5 = \frac{R_o + R_1 + R_3}{R_3}$$

for upper switch (S1) closed, $R_1$ & $R_2$ shorted, regardless of actual S2's state, and

$$K = 2 = \frac{R_0 + R_3}{R_3}$$

$$2R_3 = R_0 + R_3$$

$$R_0 = R_3$$

$$5 = \frac{R_3 + R_1 + R_3}{R_3}$$

$$5R_3 = 2R_3 + R_1$$

$$R_1 = 3R_3$$

$$10 = \frac{R_3 + 3R_3 + R_2 + R_3}{R_3}$$

$$10R_3 = 5R_3 + R_2$$

$$R_2 = 5R_3$$

One possible set:

$R_0 = 10\ k\Omega$

$R_1 = 30\ k\Omega$

$R_2 = 50\ k\Omega$

$R_3 = 10\ k\Omega$

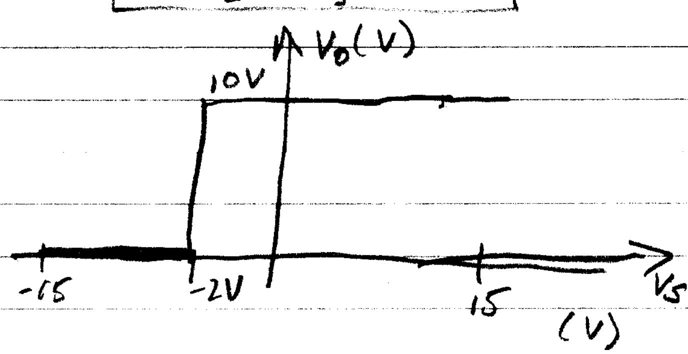
3) 4-47) $V_N = -2V$

a) $V_o = V_{OH}$ for $V_S > V_N$

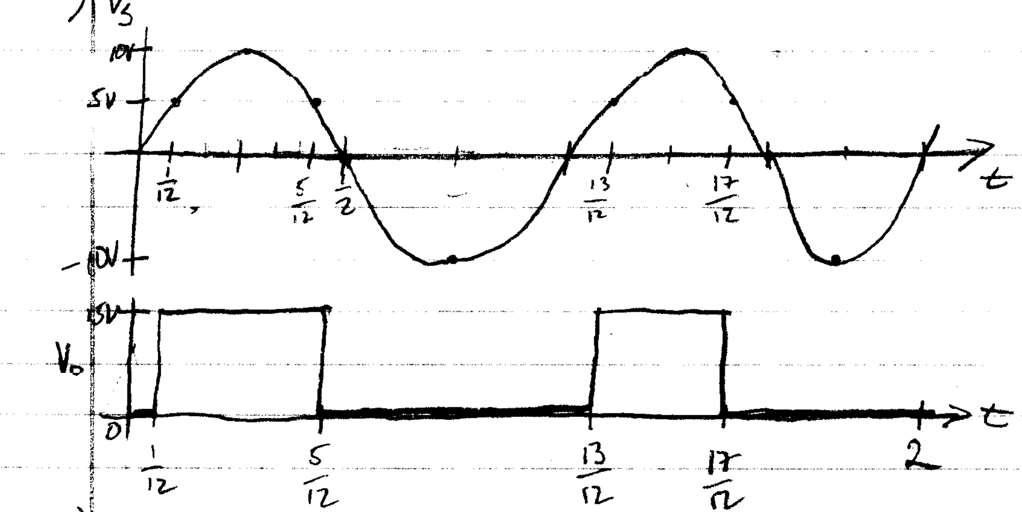
$V_o = V_{OH}$ for $V_S > -2V$

$V_o = V_{OL}$ for $V_S < -2V$

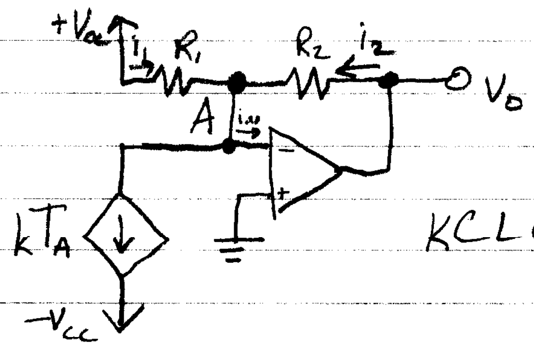
b)



4) 4-51)




5) 4-56)




$V_P = V_N = 0V$

KCL @ A: $i_1 + i_2 = kT_A + 0$

$$\frac{V_{cc}}{R_1} + \frac{V_o}{R_2} = kT_A$$

$$\Delta V_o = k R_2 \Delta T_A$$

$$\frac{\Delta V_o}{\Delta T_A} = k R_2$$

$$R_2 = \frac{\Delta V_o}{\Delta T_A} \cdot \frac{1}{k} = \frac{100mV}{°C} \cdot \frac{°K}{\mu A} = 100k\Omega$$

at $T_A = 0°C = 273K$

$V_o = 0\ V$

$$\frac{V_{cc}}{R_1} + \frac{0V}{R_2} = kT_A$$

$$R_1 = \frac{V_{cc}}{kT_A} = \frac{10V}{1\frac{\mu A}{K} \cdot 273K} = \frac{10}{273} \frac{V}{\mu A} \approx .0366\ M\Omega \approx 36.6\ k\Omega$$

$R_1 \approx 36.6k\Omega$
$R_2 = 100k\Omega$