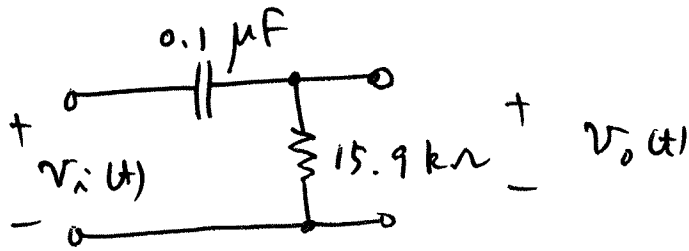


2014년 2학기 기출전과답안 기말라사

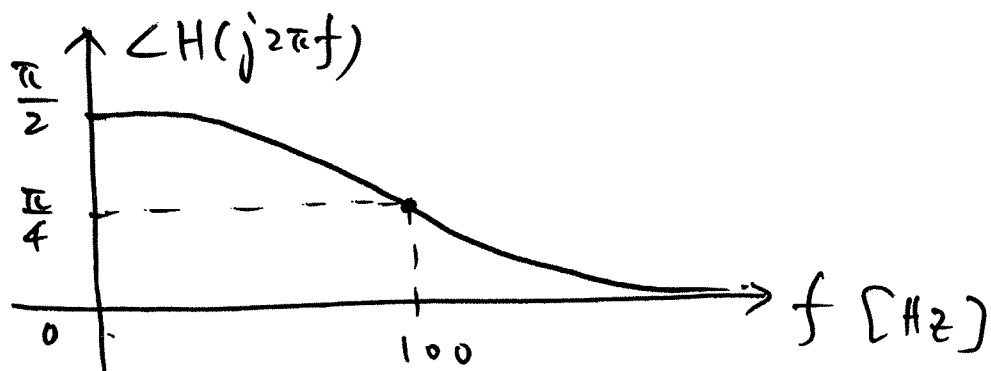
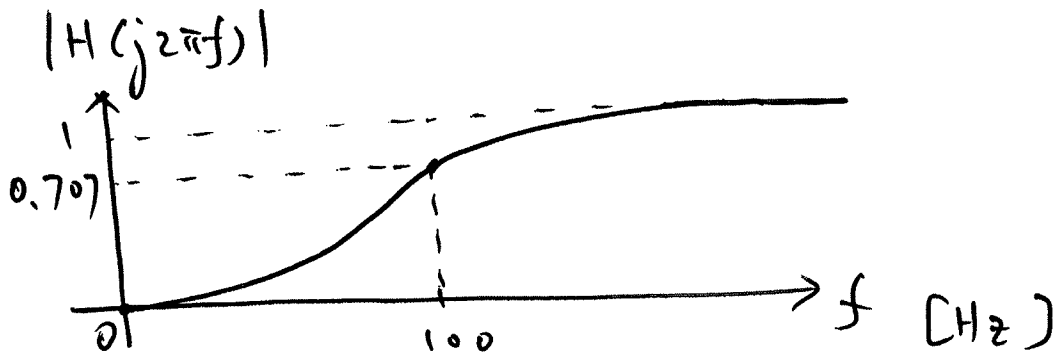
①



②

$$H(j\omega) = \frac{V_o(j\omega)}{V_i(j\omega)} = \frac{R}{\frac{1}{j\omega C} + R}$$

$$= \frac{j\omega RC}{1 + j\omega RC} \doteq \frac{j \frac{f}{100}}{1 + j \frac{f}{100}}$$



③ $v_i(t) = 10 \cos(2\pi \times 10t) \Rightarrow f = 10 \text{ Hz}$

$$H(j2\pi f) \doteq \frac{j^{0.1}}{1 + j^{0.1}} \doteq 0.1 \angle 1.47$$

$$V_i = 10 \angle 0 \text{ 이므로 } V_o = 1 \angle 1.47$$

$$v_o(t) \doteq \cos(2\pi \times 10 t + 1.47)$$

$$\doteq \cos\left[2\pi \times 10 (t + 0.02)\right] \text{ [V]}$$

③ $v_i(t) = 10 \cos(2\pi \times 100 t) \Rightarrow f = 100 \text{ Hz}$

$$H(j2\pi f) = \frac{j}{1+j} \doteq 0.707 \angle \frac{\pi}{4}$$

$$v_o(t) \doteq 7.07 \cos\left(2\pi \times 100 t + \frac{\pi}{4}\right)$$

$$\doteq 7.07 \cos\left[2\pi \times 100 (t + 1.25 \times 10^{-3})\right] \text{ [V]}$$

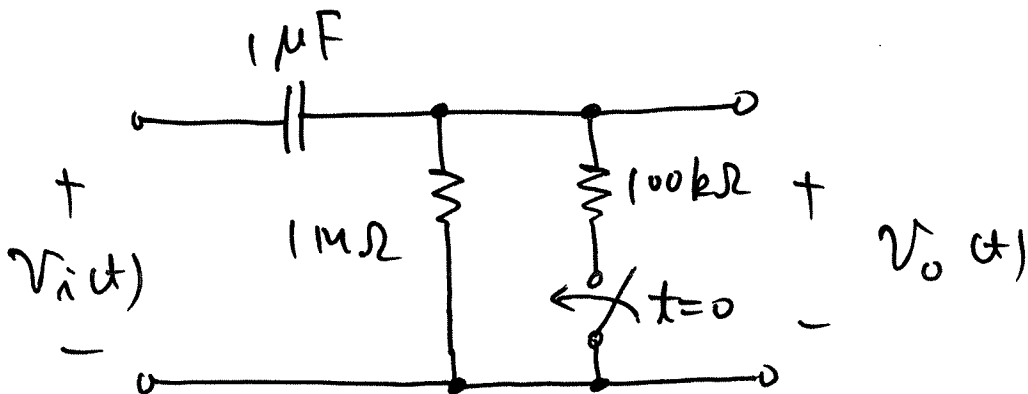
④ $v_i(t) = 10 \cos(2\pi \times 1000 t) \Rightarrow f = 1000 \text{ Hz}$

$$H(j2\pi f) = \frac{j10}{1+j10} \doteq 0.995 \angle 0.1$$

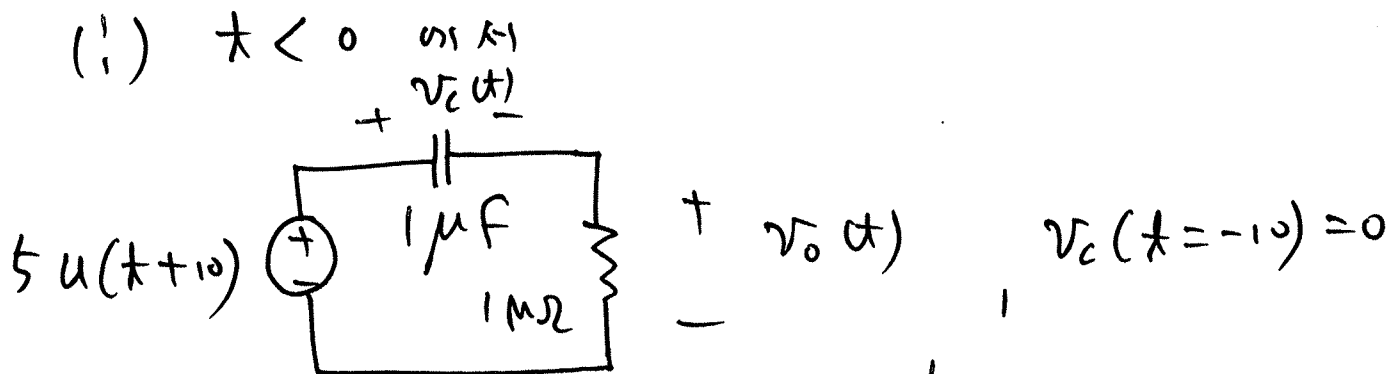
$$v_o(t) \doteq 9.95 \cos(2\pi \times 1000 t + 0.1)$$

$$\doteq 9.95 \cos\left[2\pi \times 1000 (t + 1.6 \times 10^{-5})\right] \text{ [V]}$$

②

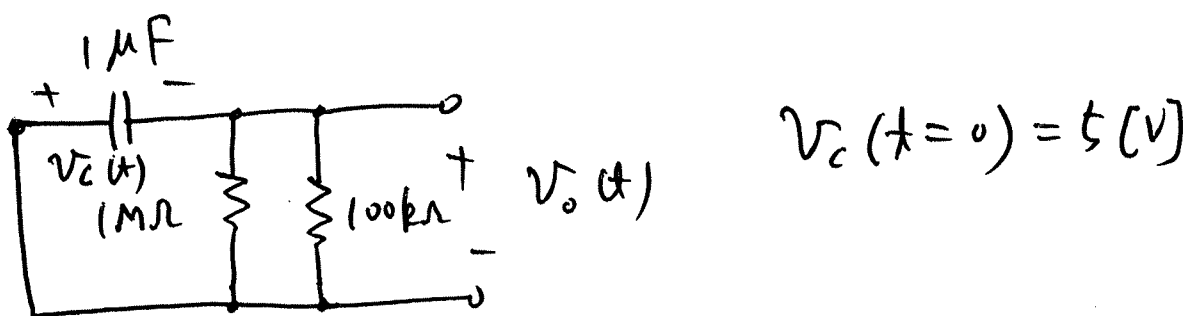


(i) $t < 0$ ms

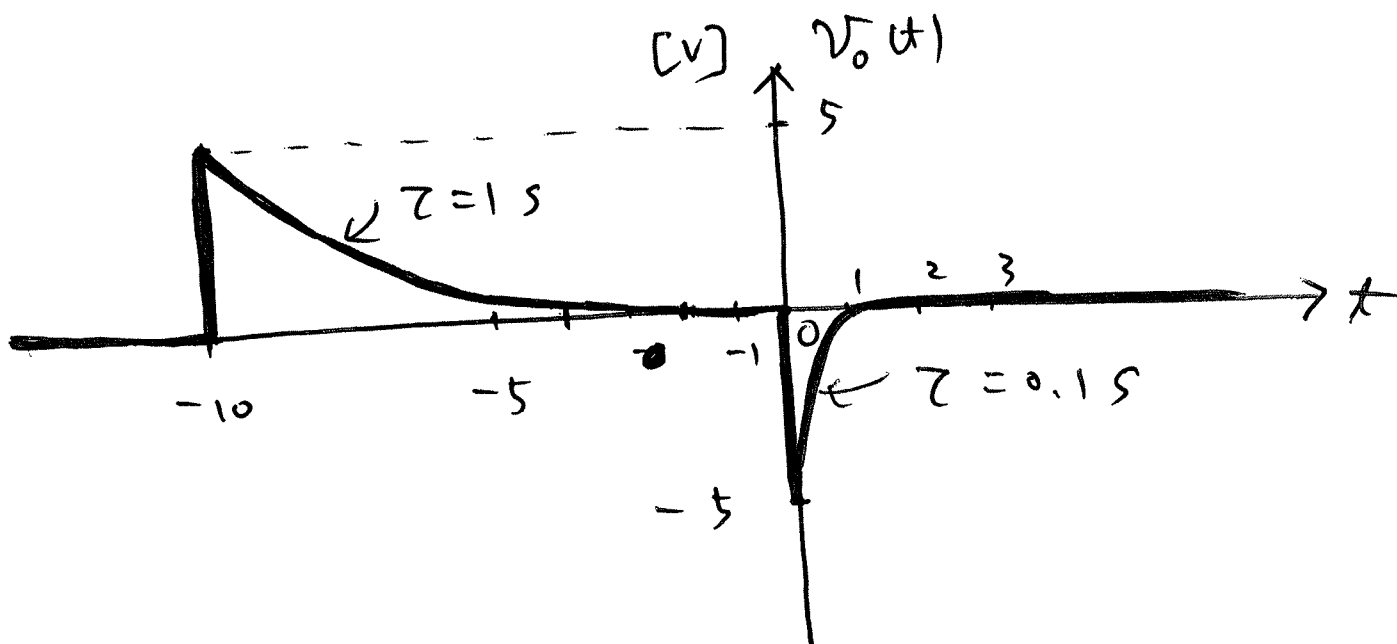


$$\tau = RC = 10^6 \times 10^{-6} = 1 [s]$$

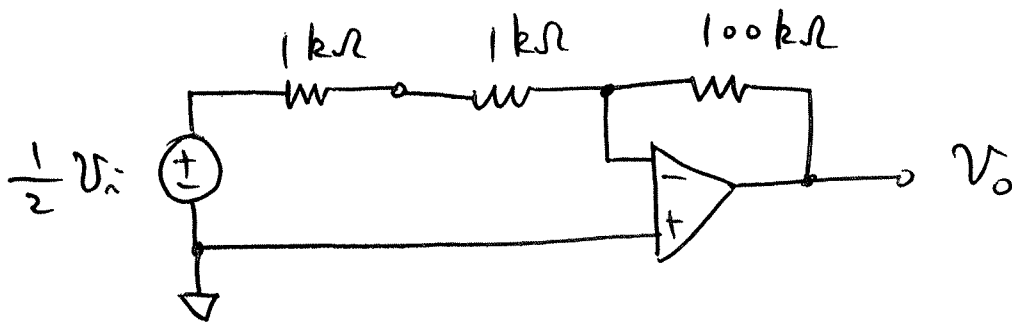
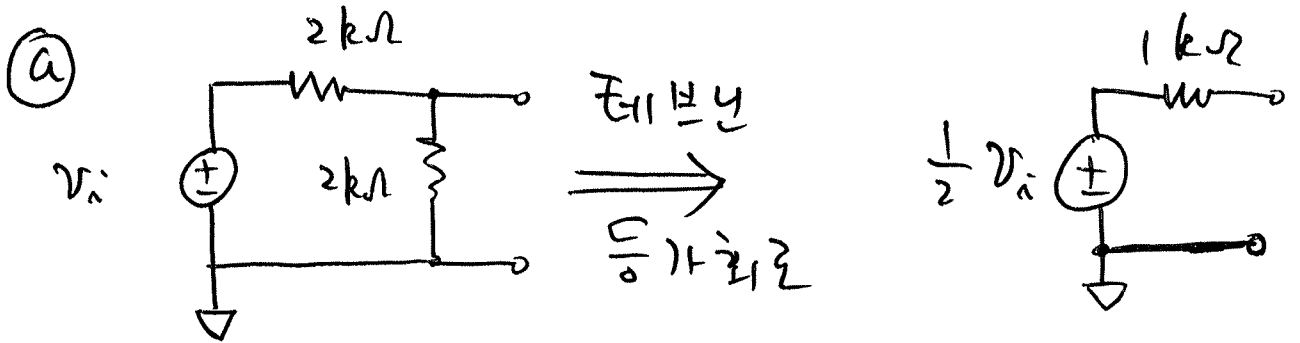
(ii) $t \geq 0$ ms



$$\tau = (10^6 // 10^5) \times 10^{-6} \doteq 0.1 [s]$$



③ $v_i(t) = 10 \sin(2\pi \times 100t) \text{ [mV]}$

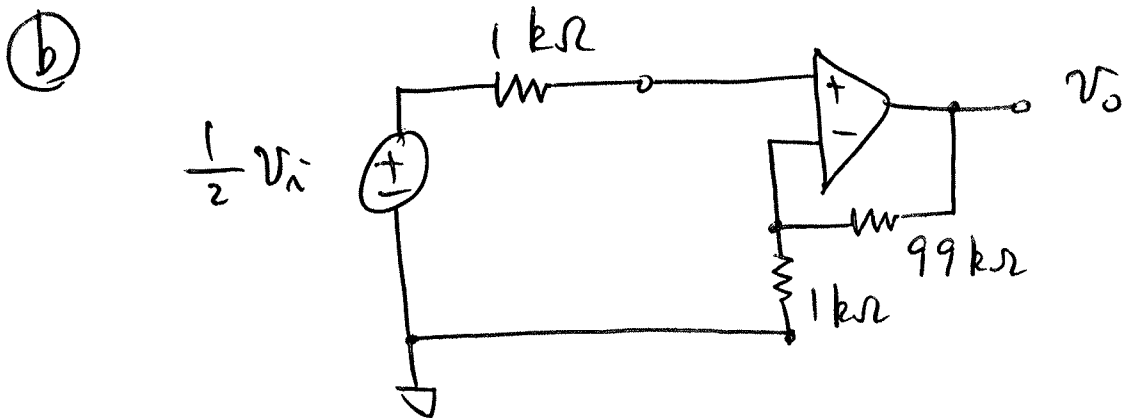


$$v_o(t) = - \frac{100}{2} \times \frac{1}{2} v_i(t)$$

$$= -250 \sin(2\pi \times 100t) \text{ [mV]}$$

반전 증폭기만의 전압이득 = $-\frac{100}{1} = -100$

회로 전체의 전압이득 = $-\frac{250}{10} = -25$



$$v_o(t) = \left(1 + \frac{99}{1}\right) \times \frac{1}{2} v_i(t)$$

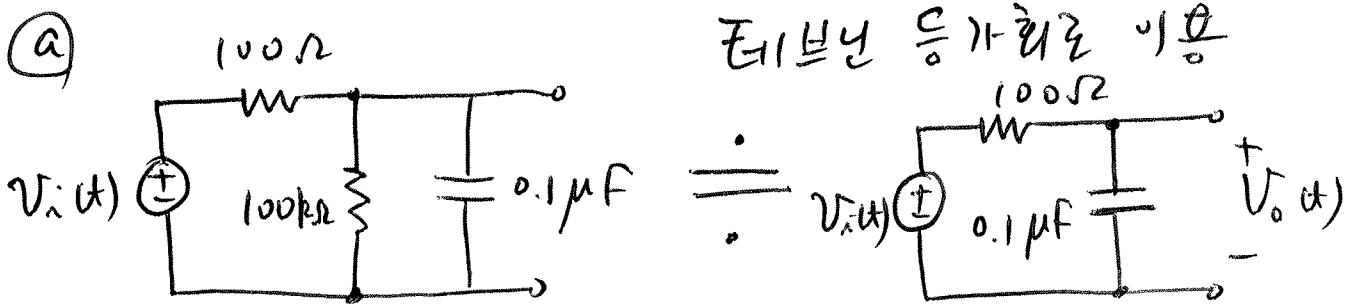
$$= 500 \sin(2\pi \times 100t) \text{ [mV]}$$

비반전 증폭기 만의 전압이득 = $1 + \frac{99}{1} = 100$

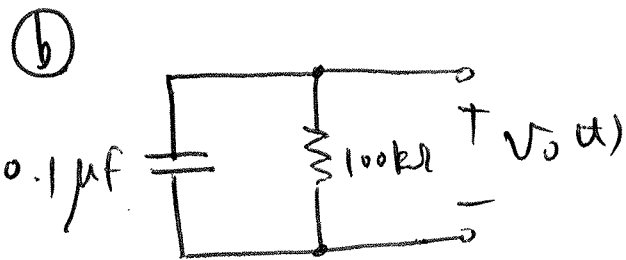
회로 전체의 전압이득 = $\frac{500}{10} = 50$

(c) 반전 증폭기인 경우에는 입력에서 부호역전도 발생해서 전체 전압이득이 감소함.

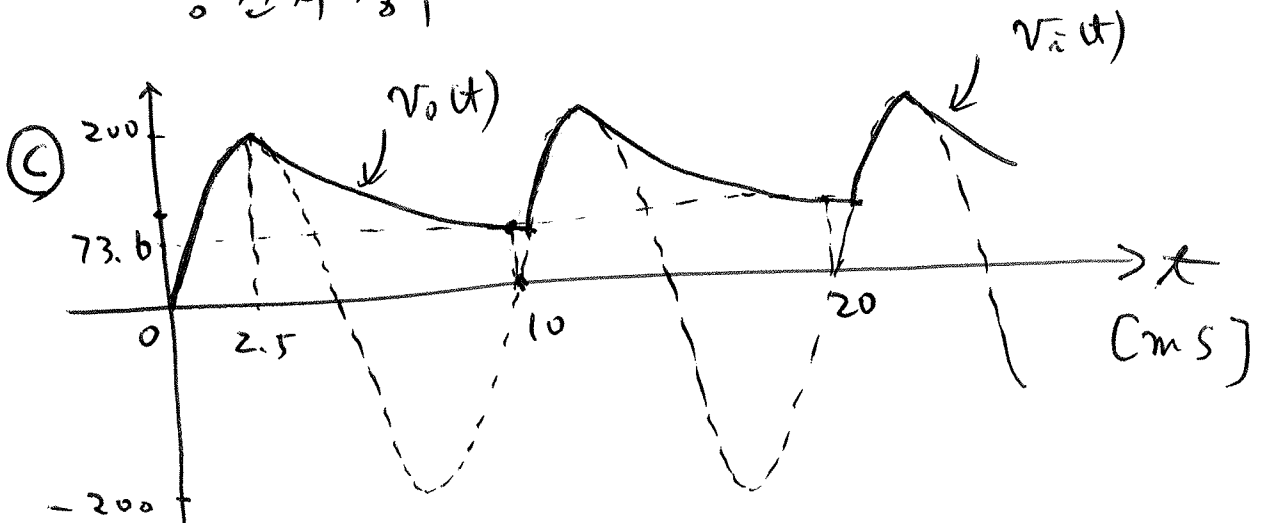
(4)



충전시정수 $\tau_1 = 10^2 \times 10^{-7} = 10^{-5} \text{ s}$

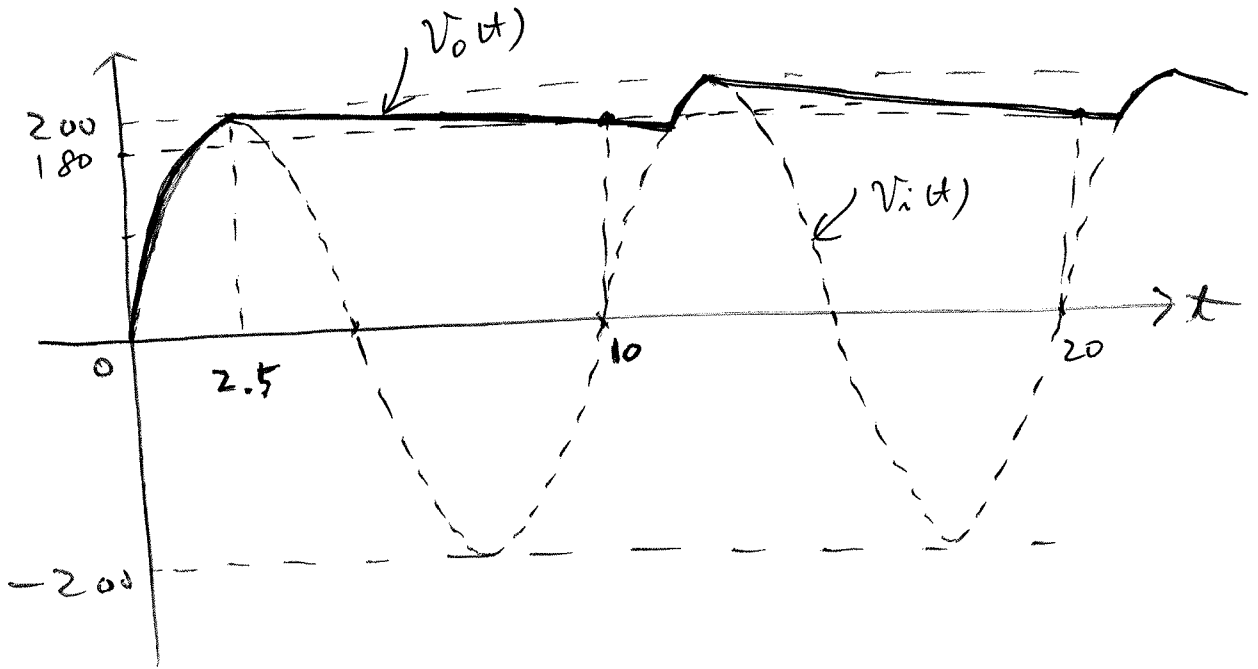


방전시정수 $\tau_2 = 10^5 \times 10^{-7} = 10^{-2} \text{ s}$



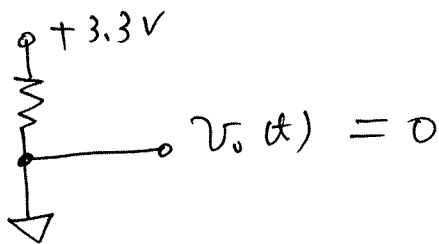
④

$\frac{1}{2}$ 전이 지수 $\tau_1 = 10^{-4} \text{ s}$
 반 전이 지수 $\tau_2 = 10^{-1} \text{ s}$

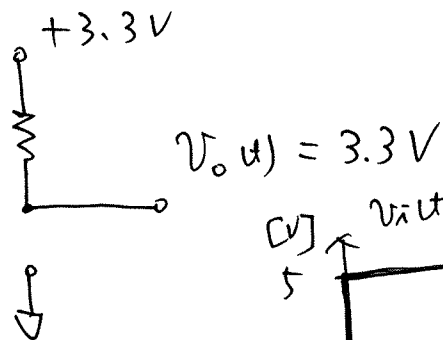


⑤

(!) LED ON $\frac{1}{2}$ case



(!!) LED OFF $\frac{1}{2}$ case



Inverter $\frac{1}{2}$ case

NOT gate $\frac{1}{2}$ case

