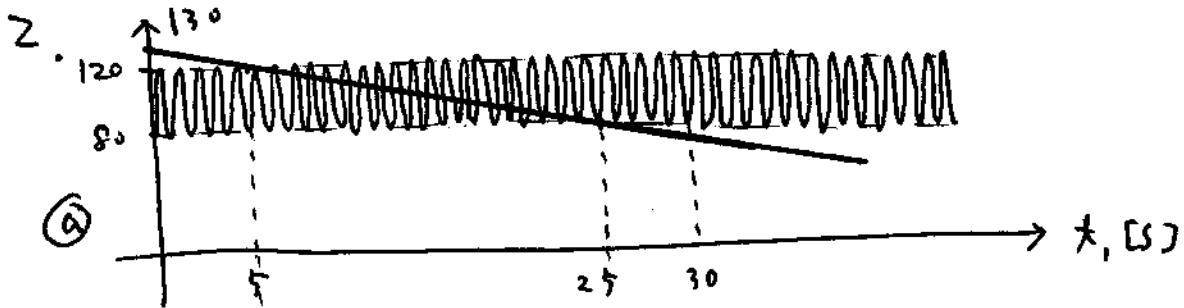
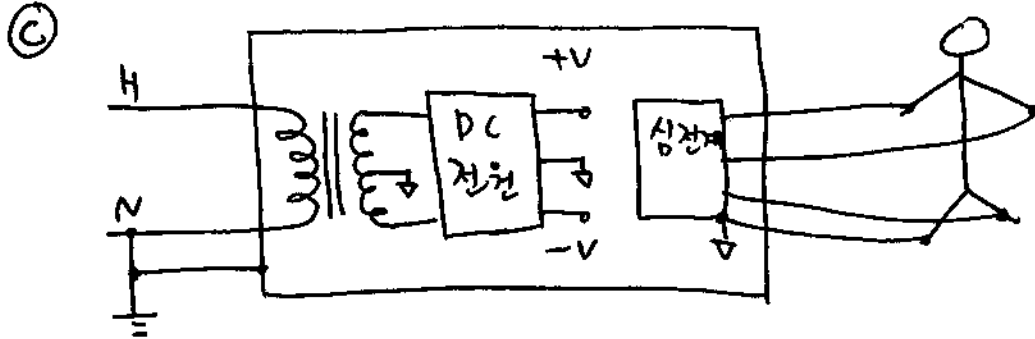


2000년 2학기 기말고사 해답

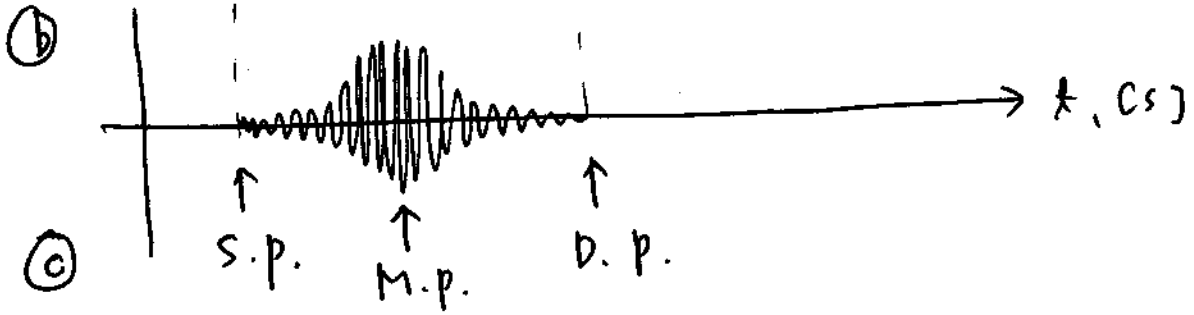
1.

(a) Macroshock

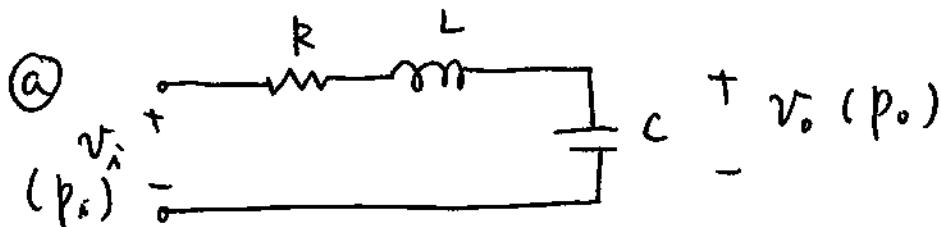
(b)
$$I = \frac{220}{200 + 0.25 + 0.1 + 0.25} \approx 1.1 \text{ mA}$$



$$\Delta p = 130 - 80 = 50, \quad \frac{50}{2} = 25 \approx$$



3.

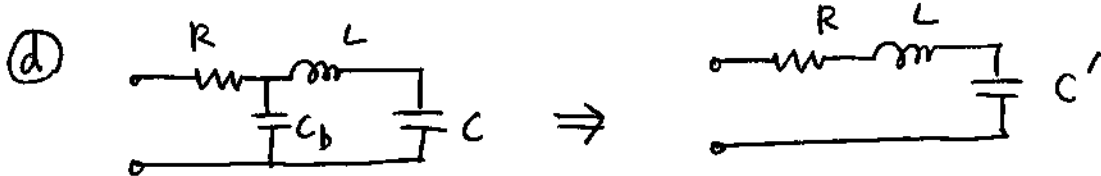


R : catheter \Rightarrow liquid resistance
 L : " " " " " inertance
 C : diaphragm \Rightarrow compliance

$$(b) R = \frac{P}{F}, \quad L = \frac{P}{\frac{dF}{dt}}, \quad C = \frac{V}{P}$$

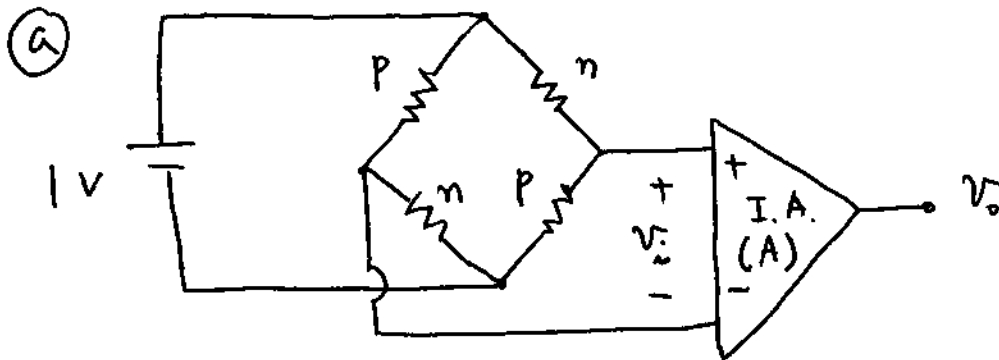
$$(c) \left. \begin{aligned} v_i &= R i + L \frac{di}{dt} + v_o \\ i &= C \frac{dv_o}{dt} \end{aligned} \right\} \text{ circuit}$$

$$v_i = RC \frac{dv_o}{dt} + LC \frac{d^2 v_o}{dt^2} + v_o$$



$$\left. \begin{aligned} \text{damping ratio } \frac{\gamma}{\omega_n} &= \frac{RC}{2L} \\ \text{natural freq. } \omega_n &= \frac{1}{\sqrt{LC}} \end{aligned} \right\} \Rightarrow \frac{\gamma}{\omega_n} = \frac{RC}{2L} \cdot \frac{1}{\sqrt{LC}} = \frac{RC}{2\sqrt{LC}}$$

4.



$$(b) \frac{\Delta L}{L} \Big|_{\max} = \pm \frac{0.05}{100}, \quad G = \frac{\Delta R/R}{\Delta L/L} = \pm 100$$

$$\frac{\Delta R}{R} \Big|_{\max} = \pm 100 \times \frac{0.05}{100} = \pm 0.05$$

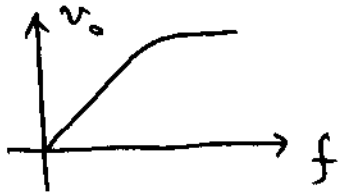
Four active arm bridge $\Rightarrow \frac{\Delta R}{R} = \frac{\Delta L}{L}$, v_i

$$v_i = \frac{\Delta R}{R} \times 1 \text{ V} = 0.05 \text{ V}$$

$$v_i \Big|_{\max} = \pm 0.05 \text{ V}, \quad v_o \Big|_{\max} = v_i \Big|_{\max} \times A = \pm 5 \text{ V}$$

output, $A = 100$

③ Cantilever의 무게를 알지 못하는 중첩을 올려 놓은
 출력력 v_o 를 측정하여 인가한 힘 (f)과 v_o 의
 관계를 그래프로 그린다. 이 그래프의 데이터는
 이용하여 v_o 를 부러 f 를 구한다.



5. ① $C_x = \epsilon_0 \frac{A}{x} = 8.8 \times 10^{-12} \times \frac{5 \times 10^{-4}}{x \times 10^{-2}}$
 (x 는 mm 단위) $= 4.4 \times \frac{1}{x}$ pF

$x|_{\min} = 0.8 \text{ mm} \Rightarrow C_x|_{\max} = \frac{4.4}{0.8} = 5.5 \text{ pF}$

$x|_{\max} = 1.2 \text{ mm} \Rightarrow C_x|_{\min} = \frac{4.4}{1.2} \doteq 3.7 \text{ pF}$

② $V_o(j\omega) = - \frac{\frac{1}{j\omega C_x}}{\frac{1}{j\omega C_o}} V_i(j\omega) = - \frac{C_o}{C_x} V_i(j\omega)$
 $= -x V_i(j\omega)$

$\therefore v_o(t) = -x v_i(t)$

