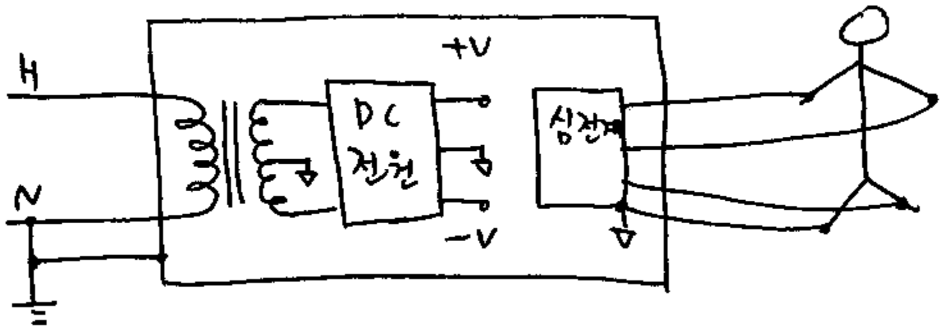
2000년 2학기 기말고사 해답

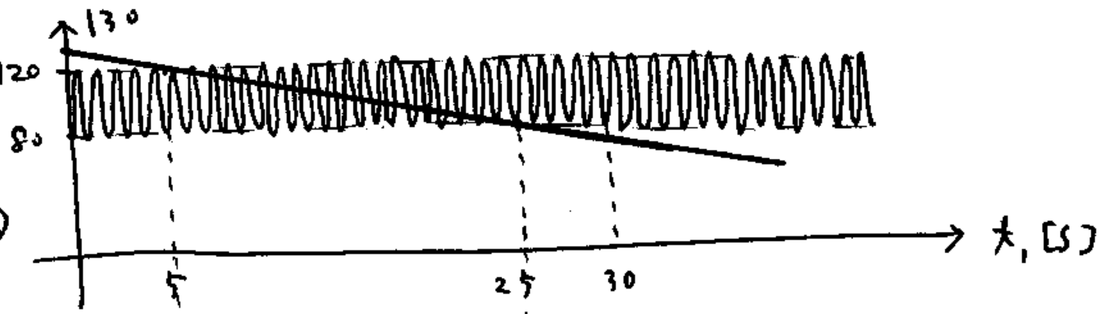
1. ⓐ Macroshock

ⓑ $I = \dfrac{220}{200 + 0.25 + 0.1 + 0.25} \fallingdotseq 1.1\ \text{mA}$

ⓒ



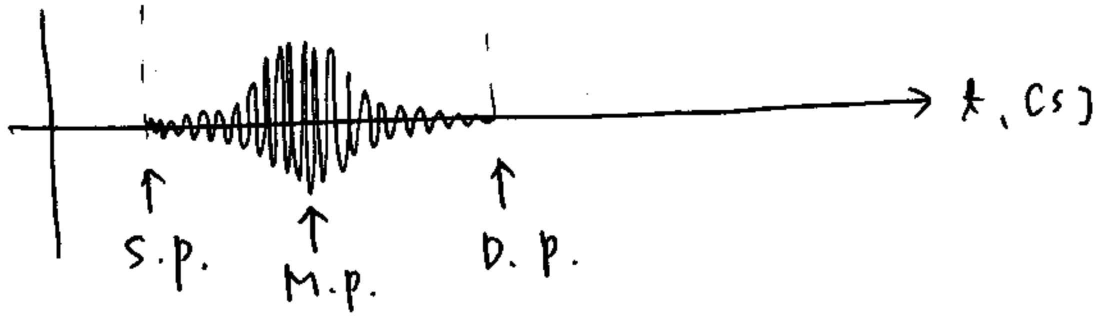
2.



ⓐ

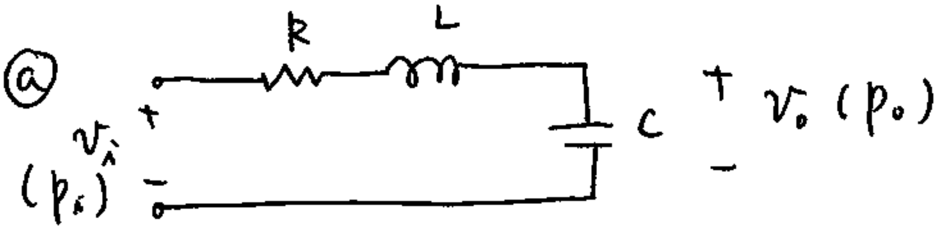
$\Delta p = 130 - 80 = 50$, $\dfrac{50}{2} = 25$ 초

ⓑ



ⓒ

3. ⓐ

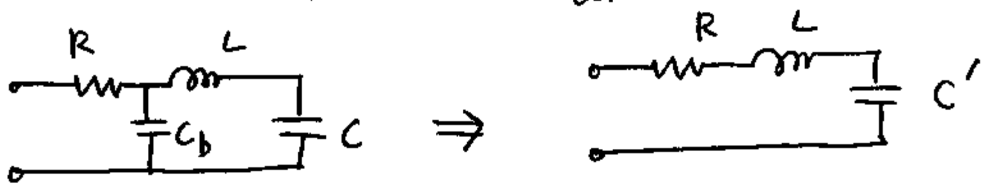


R : catheter의 liquid resistance
L : 〃 inertance
C : diaphragm의 compliance

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

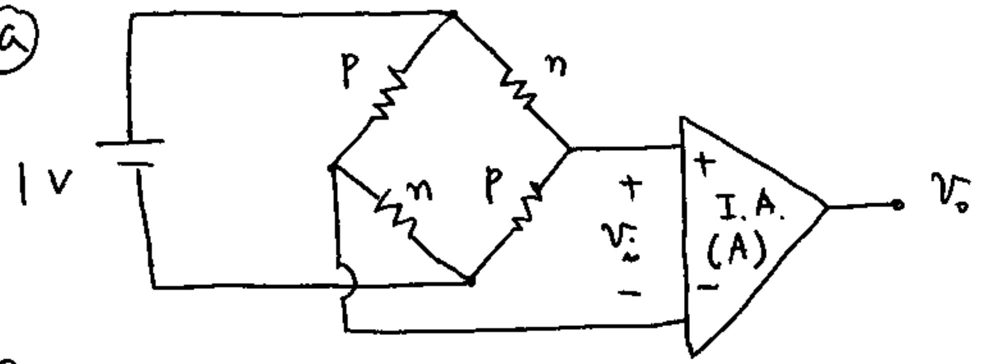
ⓒ $\left.\begin{aligned} v_i &= R\,i + L\frac{di}{dt} + v_o \\ i &= C\frac{dv_o}{dt} \end{aligned}\right\}$ 에서

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

ⓓ 

damping ratio 증가 } ⇒ 주파수 대역이 줄어든다.
natural freq. 감소 }

4.

ⓐ 

ⓑ $\left.\frac{\Delta L}{L}\right|_{max} = \pm\frac{0.05}{100}$, $G = \frac{\Delta R/R}{\Delta L/L} = \pm 100$

$$\left.\frac{\Delta R}{R}\right|_{max} = \pm 100 \times \frac{0.05}{100} = \pm 0.05$$

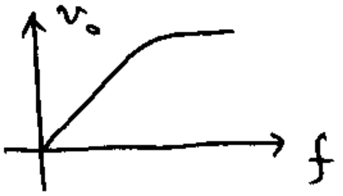
Four active arm bridge의 출력, v_i

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

$\left.v_i\right|_{max} = \pm 0.05$ V , $\left.v_o\right|_{max} = \left.v_i\right|_{max} \times A = \pm 5V$

따라서, $A = 100$

ⓒ Cantilever 에 무게를 알고 있는 추들을 올려 놓고 출력 v_o 를 측정하여 인가한 힘 (f) 과 v_o 의 관계를 그래프로 그린다. 이 그래프의 데이터를 이용하여 v_o 로 부터 f 를 구한다.



5. ⓐ $C_x = \varepsilon_o \dfrac{A}{x} = 8.8 \times 10^{-12} \times \dfrac{5 \times 10^{-4}}{x \times 10^{-3}}$

(x는 mm 단위) $= 4.4 \times \dfrac{1}{x}$ pF

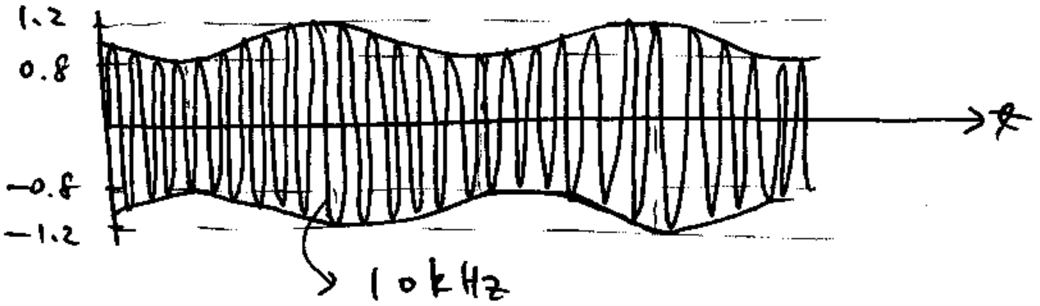
$x|_{min} = 0.8$ mm $\Rightarrow$ $C_x|_{max} = \dfrac{4.4}{0.8} = 5.5$ pF

$x|_{max} = 1.2$ mm $\Rightarrow$ $C_x|_{min} = \dfrac{4.4}{1.2} \doteqdot 3.7$ pF

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

$= - x \, V_i(j\omega)$

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



ⓒ