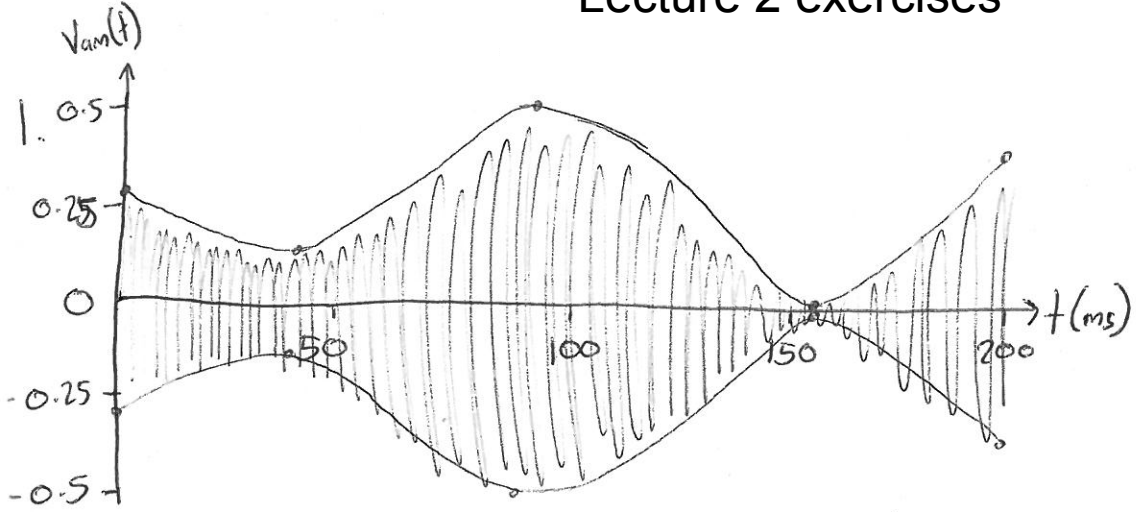
Lecture 2 exercises

1.



400 Hz → 80 cycles

200 ms

- DC offset $V_c = 0.25$
- modulation sensitivity $k = 1$
- modulation index $m = 100\%$

2.

$$V_o(t) = \left(1 + \frac{R_f}{R_i}\right) V_c(t)$$

$$V_c(t) = V_c \cos(2\pi f_c t)$$

$$R_i = \frac{1}{a\, V_m(t)}$$

$$V_o(t) = \left(V_c + \underbrace{V_c R_f a}\, V_m(t)\right) \cdot \cos(2\pi f_c t)$$

V_c: DC offset; k: modulation sensitivity

$V_c = 0.25$ $\quad V_c R_f a = k$ $\quad$ so $R_f = 2\,\Omega$

(0.25, 2, 1)

3.

$$(R_f + R_s) C \ll \frac{1}{f_c}$$

($20\,\Omega$, $50\,\Omega$, 400 Hz)

so $C \ll 3.5 \times 10^{-5}$

let's choose $C = 1\,\mu F$

$$R_L C \ll \frac{1}{f_{max}}$$

($1\,\mu F$, 10 Hz)

so $R_L \ll 100000$

$$R_L C \gg \frac{1}{f_c}$$

($1\,\mu F$, 400 Hz)

so $R_L \gg 2500$

let's choose $R_L = 15\,k\Omega$