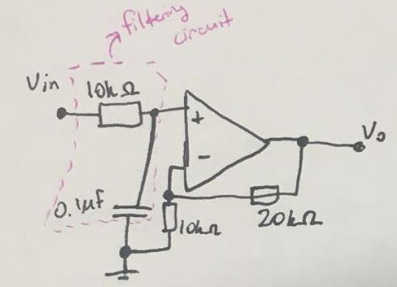
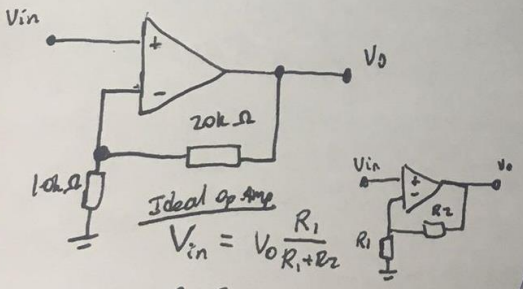
3TA4 Lab 4

TEMPERATURE SENSOR

- outputs 0mV ± 10mV/°C



↳ without filter



Ideal op Amp

$$V_{in} = V_o \frac{R_1}{R_1+R_2}$$

$$\frac{V_o}{V_{in}} = \frac{R_1+R_2}{R_1}$$

$$= \frac{10k\Omega + 20k\Omega}{10k\Omega}$$

$$\frac{V_o}{V_{in}} = 3$$

$V_{in} = \frac{1}{3} V_o$

- PB6 → PWM
- PA1 → ADC

PWM CALCULATIONS

- TIM4 Prescaler ⇒ set to get frequency f_{Clk_CNT} = 50kHz

$$T_{PWM} = \frac{ARR+1}{f_{Clk\_CNT}}$$

↳ set ARR = 199 (Period)

$$T_{PWM} = \frac{200}{50kHz} = 0.004s = 4ms$$

$$\text{duty cycle} = \frac{CCR}{ARR+1} \times 100\%$$

$$= \frac{CCR}{200} \times 100\%$$

dutycycle · 200 = CCR

Accuracies

- LM35: ±0.5°C accuracy
- ADC: resolution → 12 bits, (2^{12}) 4095 values it can take on in 3V range
  ↳ 0.0007V error/uncertainty
- Also inaccuracy produced in op amp → input offsets will affect output, increase inaccuracy in overall circuit