

Done by:- Devdhar Kodnatar

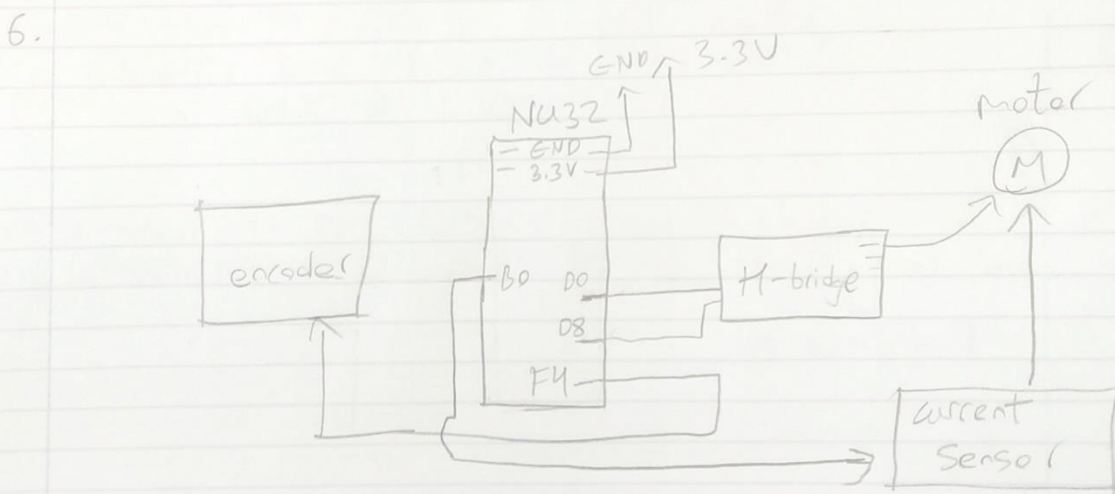
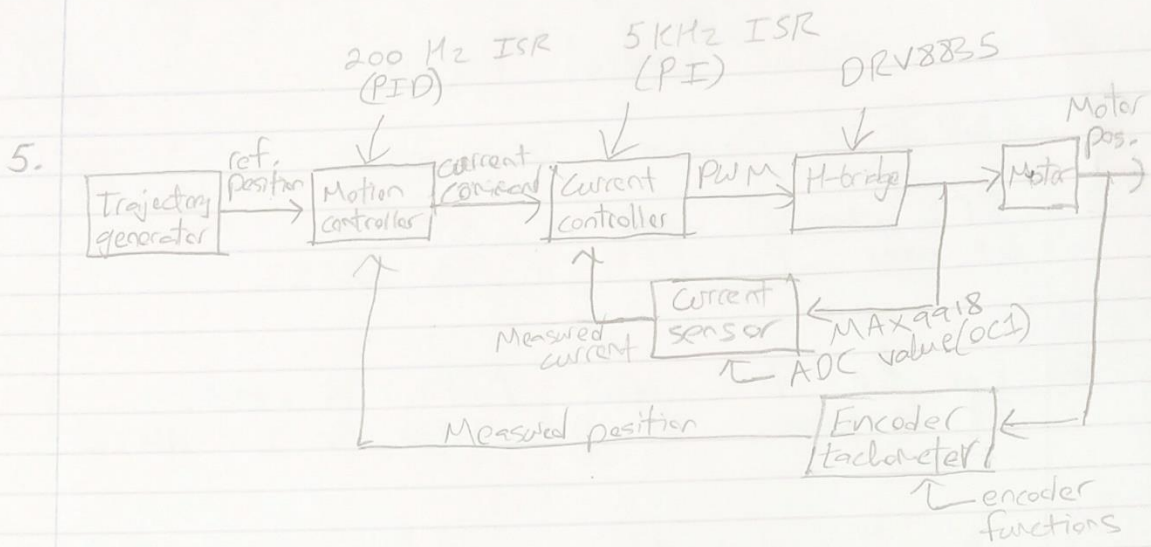
ME-333

23/20/19

Motor Control Project

28.4.1 :- Decisions, Decisions :-

1. SPI channel used is SDI 4.
It uses Pin RF4 in the NU32
2. For the ADC input, AN0 is used.
It is present in pin RBO in the NU32
3. For the H-bridge,
direction bit = RD8
PWM = OC1 and Timer 3
(OC1 @ RBO in NU32)
4. For 200 Hz position control ISR \rightarrow Timer 4 (P=4)
and for 5 kHz current control ISR \rightarrow Timer 2 (P=5)
P = priority



$$R_3 = 330 \Omega$$

$$R_{\text{motor}} = 16 \Omega$$

28.4.7 :- ADC for Current Sensor

$$2. \quad I_{\text{max}} = \frac{2V}{R_{\text{motor}}} = 0.75 \text{ A}$$

$$3. \quad V_{\text{max}} = I_{\text{max}} \cdot R_1 = 0.011 \text{ V} \quad \checkmark$$

$$4. \quad G = \frac{1.65 \text{ V}}{V_{\text{max}}} = 146.67$$

$$1 + \frac{R_2}{R_1} = 146.67$$

$$\Rightarrow \frac{R_2}{R_1} = 145.67$$

Choosing $R_1 = 1000 \Omega$, $R_2 = 150000 \Omega$

$$5. \quad f_c = \frac{1}{2\pi RC} = 200 \text{ Hz}$$

$$RC = 0.0008$$

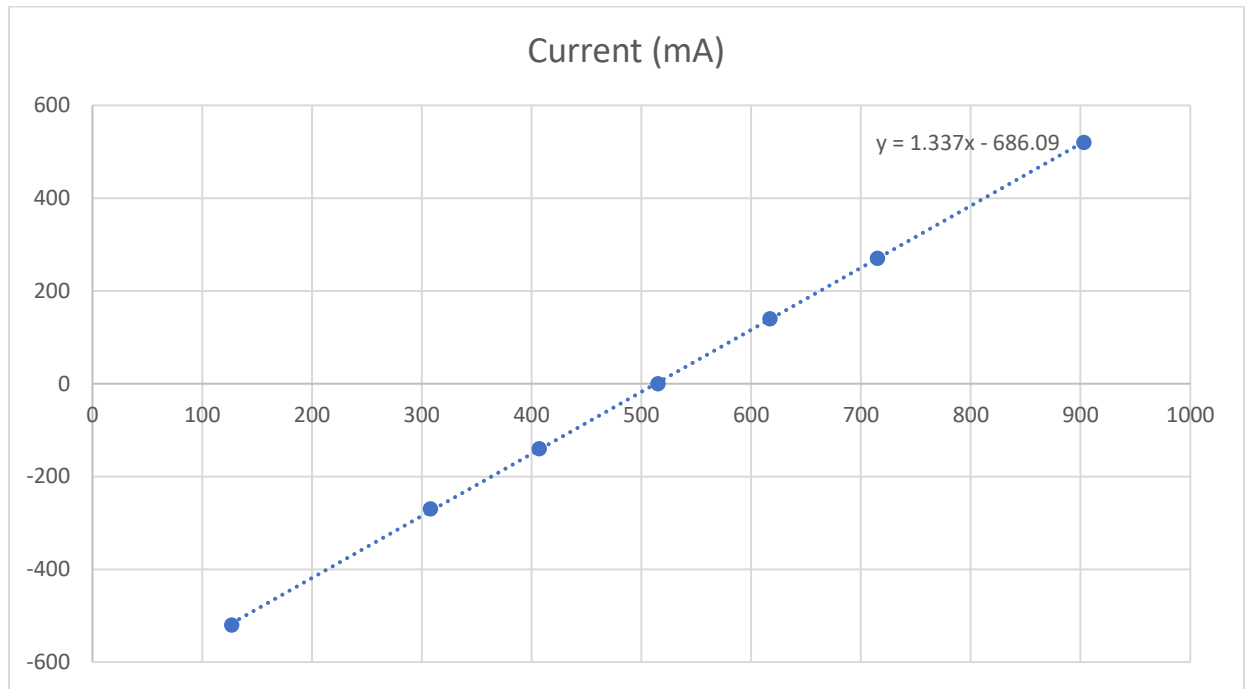
Choosing $R \approx 800 \Omega$, $C = 1 \mu\text{F}$
 \downarrow
series, 640Ω and 150Ω

6.	$R_O(\Omega)$	Expected $I(\text{mA})$	Measured $I(\text{mA})$	Sensor (V)
	10 (to R_{S+})	600	530	2.78
	20 (to R_{S+})	300	280	2.24
	40 (to R_{S+})	150	140	1.95
	Open circuit	0	0	1.64
	40 (to R_{S-})	-150	-140	1.37
	20 (to R_{S-})	-300	-280	1.09
	10 (to R_{S-})	-600	-530	0.57

Updated $I(\text{mA})$ with ADC :-
(After doing ADC for current sensor)

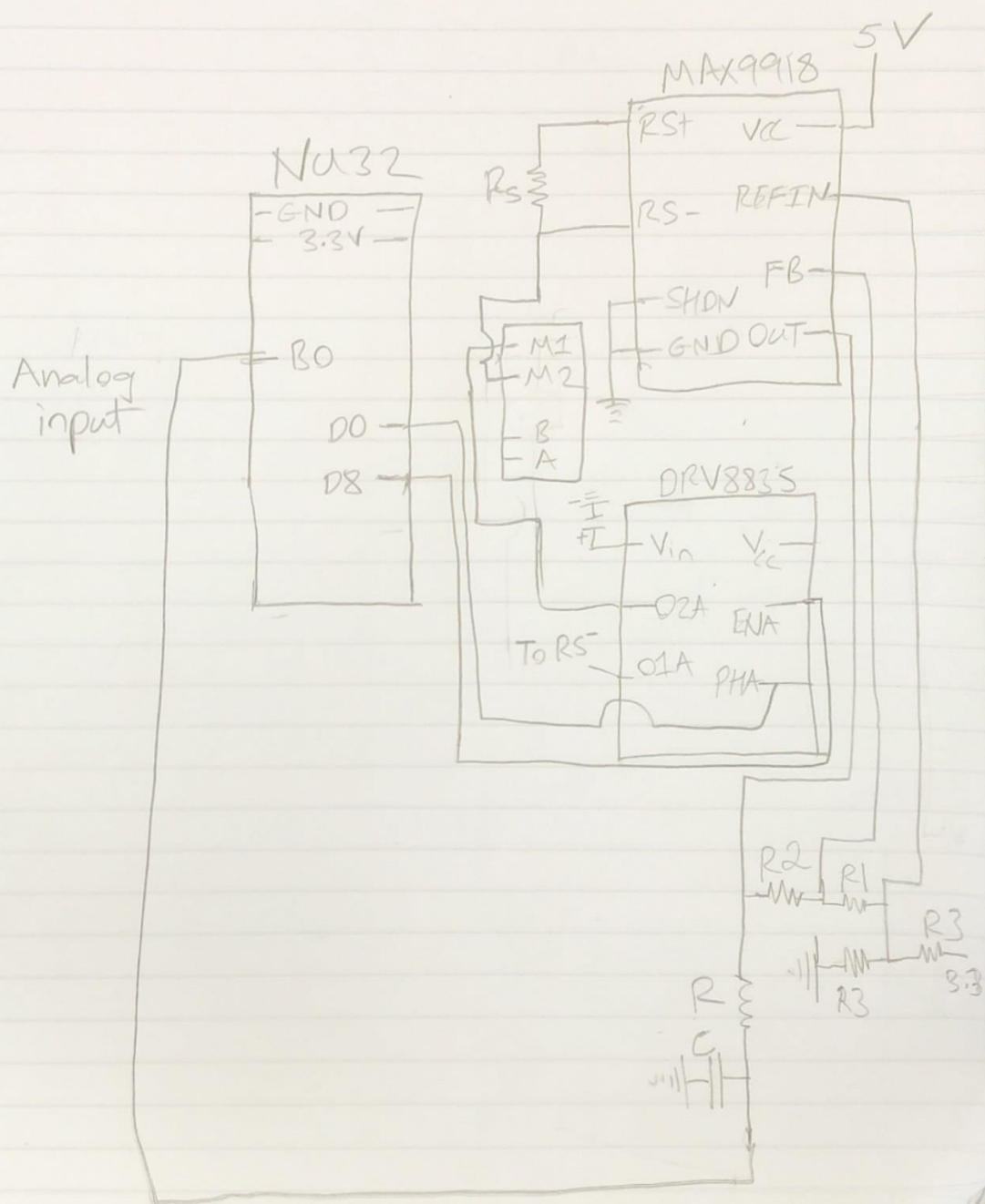
$R_O(\Omega)$	Measured $I(\text{mA})$	ADC (counts)
10 (to R_{S+})	520	903
20 (to R_{S+})	270	715
40 (to R_{S+})	140	617
Open circuit	0	515
40 (to R_{S-})	-140	407
20 (to R_{S-})	-270	308
10 (to R_{S-})	-520	127

Linear regression to find the (current-adc) relationship:

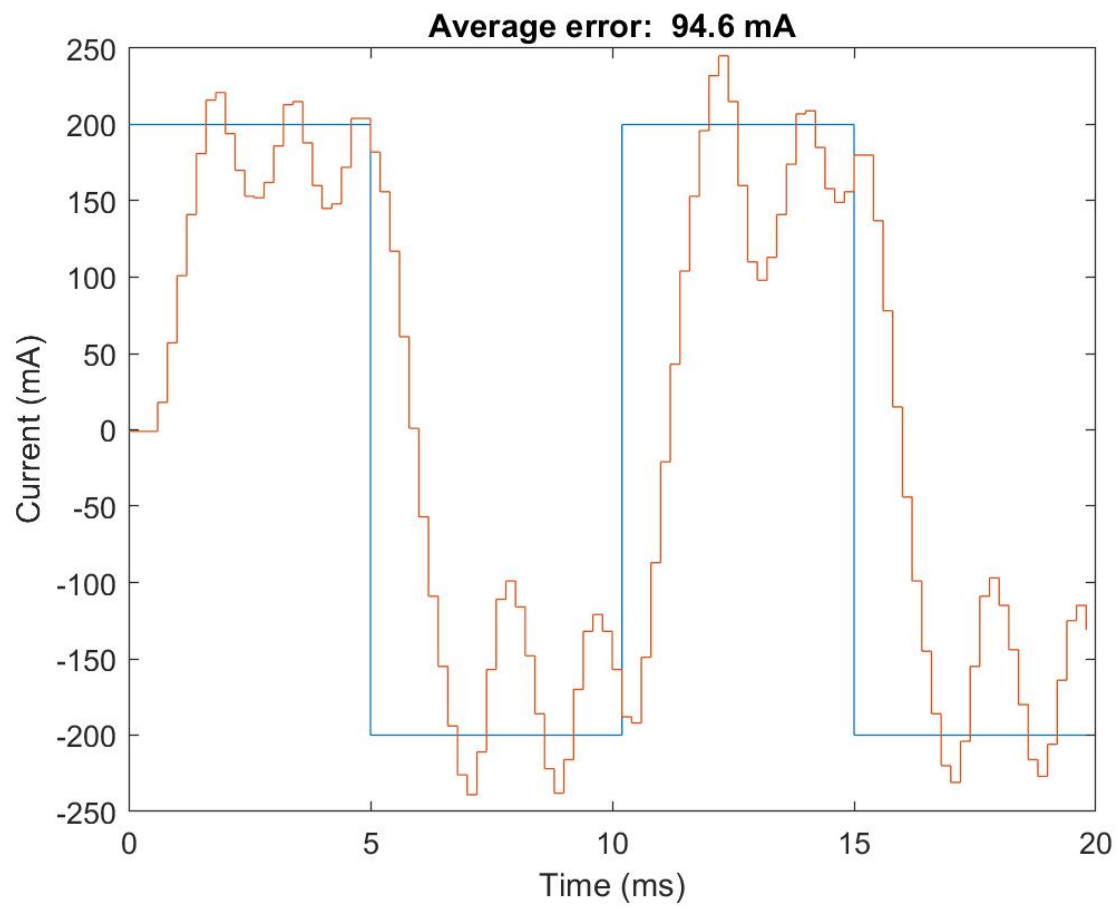


28.4.9 PWM and H-bridge :-

8.



Section 28.4.10 ITEST:-



Section 28.4.12 Trajectory Tracking:- (gain values below)

$$\text{ITEST} \rightarrow \begin{matrix} K_p & K_i \\ (-100, & 0) \end{matrix}$$

$$\text{Position control} \rightarrow \begin{matrix} K_p & K_i & K_p \\ (-100, & 0, & -300) \end{matrix}$$

with PI = $(-100, 0)$

Trajectory

Step reference input :-

$$[0, 0 ; 10, 180^\circ ; 20, 90 ; 40, 0 ; 50, 0]$$

For a step reference input:

