ELEC 3300

HOMEWORK 2

Please complete the following and submit your worksheet electronically before the deadline

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Question 1:

Part 1.a

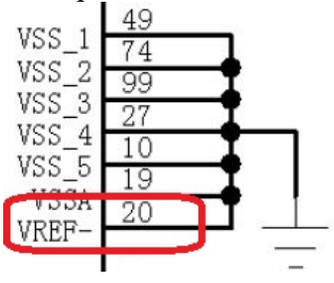
With reference to your LAB2, based on your student ID, you have Pin Set from A to G
Please fill in the following table based on your student ID. If the two digits are 00, then Pin number = 100
Pin Set G is filled as an example.

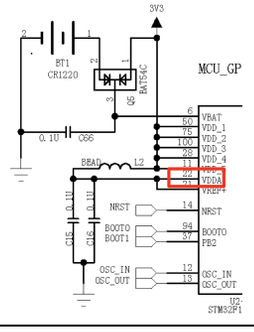
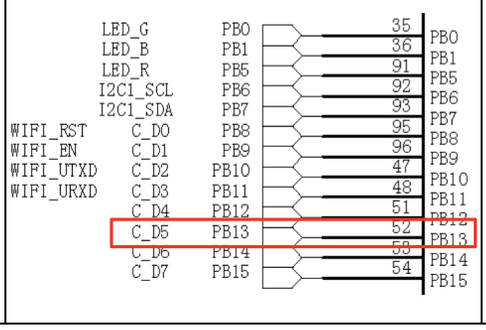
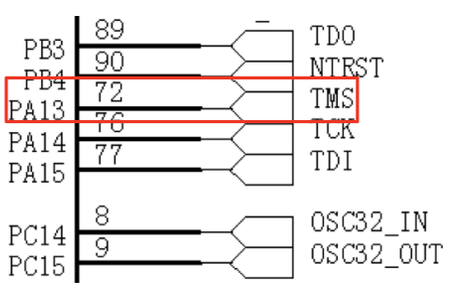
Pin Set	Actual Pin Number on STM32	Default Function of the pin on 100pin STM32F103VET6
A	22	VDDA
B	52	PB13
C	25	PA2
D	92	JTMS-SWD10
E	47	PB10
F	04	PE5
G	20	VREF–

Part 1.b

With reference to the updated MINI V3 schematic dated 20210304, for Pin **Set A, B and D**, locate where do the pin connected. Cut and Paste the detailed schematic, highlight it and attached below.

Example: Pin Set G



Pin Set A	Pin Set B	Pin Set D
		

Part 1.c
With the Pin Set A, B and D you have, fill out the following table

	Pin Set A	Pin Set B	Pin Set D
Following the connection on the schematic, if I want to set that Pin to GPIO input, what mode I can program the pin into? Please circle all the possible options. If the pin cannot be programmed to input, please circle N/A	GPIO_PULLUP GPIO_PULLDOWN GPIO_NOPULL (N/A)	(GPIO_PULLUP) (GPIO_PULLDOWN) (GPIO_NOPULL) N/A	(GPIO_PULLUP) (GPIO_PULLDOWN) (GPIO_NOPULL) N/A

Question 2:
Part 2.a
Assume a 3-minute stereo sound is being sampled at 48 kHz with 24-bit per channel, what would be the data size of the sound file in bytes? Show your calculation.

3 min ⇒ 180 sec

48 kHz ⇒ 48000 /s

48000 × 24 × 2 × 180 = 4147200000 bits = 518400000 bytes
(kHz) (bits per channel) (stereo) (sec)

Part 2.b
With the sampling rate at 48 kHz, what is the time between each sample? Show your calculation.

Sampling rate: the number of samples per second

48 kHz ⇒ 48k sample per second

Time between each sample = $\frac{1}{48000} \approx 0.0000208\overline{3}$ s

$\approx 20.83\overline{3}$ μs

Part 2.c

With the sample time that you calculate in *Part 2.b* if we want to implement the sampling from the ADC of STM32 with different settings below. What is the total number of cycles needed? Hence, calculate the conversion time (Tconv) for the different settings

$14 \times \frac{1}{2 \times 10^6} = 7 \times 10^{-6} = 7\,\mu s$

Total conversion time, Tcycle = sample cycles + 12.5 (conversion cycles)

	CLK (MHz) at the input at ADC Prescaler	**ADC Prescaler (2/4/6/8)**	**ADCCLK (MHz) Max 14 MHz**	**ADC sample time register (cycles) (1.5 – 239.5)**	**Total conversion time, Tcycle Sample time (cycles)**	**Tconv (µsec)**
Setting 1	12	6	2	1.5	14	7
Setting 2	24	4	6	28.5	41	$6.8\overline{3}$
Setting 3	36	4	9	55.5	68	$7.5\overline{5}$
Setting 4	72	8	9	239.5	252	28

Part 2.d

Can sampling in *Part 2.b* be achieved with the conversion time (Tconv) you calculated in *Part 2.c* for Setting 1 to 4? Please circle the correct answer and calculate the additional delay needed for different settings to achieve the goal.

	Can sampling be achieved	**Additional Delay needed (µsec)**
Setting 1	YES / NO	$20.8\overline{3} - 7 = 13.8\overline{3}$
Setting 2	YES / NO	$20.8\overline{3} - 6.8\overline{3} = 14$
Setting 3	YES / NO	$20.8\overline{3} - 7.5\overline{5} = 13.278$
Setting 4	YES / NO	N/A