Lab 1: Pre-Lab Assignment - SOLUTIONS Fall 2018

Student Name: _		
	Date	

1. (2 points) Enable the clock of GPIO Port A (for joystick), Port B (for Red LED) and Port E (for Green LED)

Register	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	9	2	4	3	2	1	0
AHB2ENR														RNGEN		AESEN			ADCEN	OTGFSEN					GPIOHEN	GPIOGEN	GPIOFEN	GPIOEEN	GPIODEN	GPIOCEN	GPIOBEN	GPIOAEN
Mask	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Value																												1			1	1

MASK = 0x00000013;

RCC->AHB2ENR |= 0x00000013;

Alternative solution (using constants in C):

RCC->AHB2ENR |= (RCC_AHB2ENR_GPIOAEN | RCC_AHB2ENR_GPIOBEN | RCC_AHB2ENR_GPIOEEN);

- 2. (2 points) Pin Initialization for Red LED (PB 2)
 - a. Configure PB 2 as Output

GPIO Mode: Input (00), Output (01), Alternative Function (10), Analog (11, default)

Register	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	6	œ	7	9	9	4	3	2	_	0
MODER	10.4 5.74	MODER 13[1:0]	MODER 14[1:0]	- F	10401	MODER 13[1:0]	MODER 12[1:0]	- 17 7		MODER11[1:0]	MODEP 10[1:0]	ולוועב	10.130	MODER9[1:0]	MODER8[1:0]	[0:1]	10.01	MODER/[1:0]	10:03	MODERO[1:0]	100000000000000000000000000000000000000	MODERS[1:0]	MODER4[1:0]	MODEIN4[1:0]		MODER3[1:0]	MODEP2[4:0]	- 17	MODED 4 [4:0]	MODER [1:0]	MODEB0[4:0]	MODERU[1:0]
Mask	0		00	0	00	0	0	0	0	0	00	00	0	00	00	0	0	00	00	0	00	0	0	0	0	0	10	1	0	0	0	0
Value																											0	1				

In this case, you need two masks: one to clear bits 5 and 4 and another to set bit 4. It is also possible to clear only bit 5.

GPIOB Mode Register MASK Value = 0x00000030 and 0x00000010 (in HEX)

```
GPIOB->MODER &= ~(0x00000030); //Clear bits 4 and 5

GPIOB->MODER |= 0x00000010; //Set bit 4
```

Alternative solution:

```
GPIOB->MODER &= ~(0x03<<4);
GPIOB->MODER |= 1<<4;
```

Alternative solution (using constants in C):

```
GPIOB->MODER &= ~(GPIO_MODER_MODE2);
```

GPIOB->MODER |= GPIO_MODER_MODE2_0;

b. Configure PB 2 Output Type as Push-Pull

Push-Pull (0, reset), Open-Drain (1)

Register	31 30 22 22 27 27 27 27 27 27 27 27 27 27 27			13	12	11	10	6	œ	7	9	2	4	3	2	1	0
OTYPER		OT15		~	OT12		OT10	OT9	OT8	OT7	ОТ6		OT4	ОТЗ	OT2	OT1	ОТО
Mask	Reserved	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Value															0		

GPIOB Output Type Register MASK Value = 0x00000004 (in HEX)

```
GPIOB->OTYPER &= \sim(0x00000004);
```

```
Alternative solutions:
GPIOB->OTYPER &= ~(1<<3);
GPIOB->OTYPER &= ~(GPIO_OTYPER_OT2);
```

c. Configure PB 2 Output Type as No Pull-up No Pull-down

NO PUPD (00, reset), Pullup (01), Pulldown (10), Reserved (11)

																					,,											
Register	31	30	29	28	27	26	25	24	23	22	7	20	19	18	17	16	15			12	1	10	6	œ	2	9	9	4	ဗ	7	_	0
PUPDR	2	וןכואטאי	PI IPDR14[1·0]	Or DIN 14[1.	÷	טרטא	PI IPDR12[1·0]	1711	7.7.7	PUPDR11[1:0]	יסייסיים ממוום	צ	. 220	UPD	PI IPDR8[1·0]		[0:112anai la	יויאטיט	PUPDR6[1:0]		[0:1]		PUPDR4[1:0]	. 1	10,190,01	PUPUR3[1:0]	[0.15000]	טי טואבן יו	[0:114:0]		PI IPDR0[1·0]	7
Mask	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Value																											0	0				

GPIOB Pull-up Pull-down Register MASK Value = 0x00000030 (in HEX)

GPIOB->PUPDR &= ~(0x00000030);

Alternative solutions:

GPIOB->PUPDR &= \sim(0x03<<4);

GPIOB->PUPDR &= ~GPIO_PUPDR_PUPD2;

3. (2 points) Pin Initialization for Green LED (PE 8)

a. Configure PE 8 as Output

GPIO Mode: Input (00), Output (01), Alternative Function (10), Analog (11, default)

Register	31	30	29	28	27	26	25	77	23	100	7	07	19	18	17	16	15	14	13	12	11	10	6	8	7	9	5	4	3	7	1	0
MODER	77.7.7	MODER 13[1:U]	MODER 14[1:0]	:	MODED 12[1:0]		MODER12[1:0]		MODER11[1:0]		MODER10[1:0]		MODEPort-01	MODEINS[1:0]	MODER8[1:0]	[o.,]o.,	MODE B 2[4:0]	MODER/[1:0]	MODED6[4:0]	MODERO[1.0]	MODED 5[1:0]	MODELNO[1.0]	MODER4[1:0]	WOZEIV4[1:0]		MODER3[1:0]	MODED 2[4:0]	MODENZ[1.0]	MODER 1[1:0]	MODELY [1.0]	MODEPO[1-0]	ואוכעבויטן וייכן
Mask	0		0	0	0	0	0	0			0	0	0	0	1	1	0	_	0		0	0		0		0	0	0	0	0	0	0
Value															0	1						·										

In this case, you need two masks: one to clear bits 17 and 16 and another to set bit 16. It is also possible to clear only bit 17.

GPIOE Mode Register MASK Value = 0x00030000 and 0x00010000 (in HEX)

```
GPIOE->MODER &= ~(0x00030000); //Clear bits 17 and 16

GPIOE->MODER |= 0x00010000; //Set bit 16
```

Alternative solutions:

```
GPIOE->MODER &= ~0x03<<16;
GPIOE->MODER |= 1<<16;
```

Alternative solution (using constants in C):

```
GPIOE->MODER &= ~GPIO_MODER_MODE8;
```

GPIOE->MODER |= GPIO_MODER_MODE8_0;

b. Configure PE 8 Output Type as Push-Pull

Push-Pull (0, reset), Open-Drain (1)

Register	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	6	8	7	9	5	4	3	2	1	0
OTYPER																	OT15	OT14	OT13	OT12	OT11	OT10	ОТЭ	ОТВ	OT7	ОТ6	OT5	OT4	OT3	ОТ2	OT1	ОТО
Mask							R	lese	rvec	i							0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Value																								0								

GPIOE Output Type Register MASK Value = 0x00000100 (in HEX)

GPIOE->OTYPER &= \sim(0x00000100);

Alternative solutions: GPIOE->OTYPER &= ~(1<<8); GPIOE->OTYPER &= ~(GPIO_OTYPER_OT8);

c. Configure PE 8 Output Type as No Pull-up No Pull-down

NO PUPD (00, reset), Pullup (01), Pulldown (10), Reserved (11)

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Register	31	30	29	28	22	26	25	24	23	22	21	20	19	18	17	16	15		13	12	11	10	6	8	2	9	2	4	3	7	1	0
PUPDR	77.7	L	DI 1858 4 1 1 10	UPUR 14[. 2017	PUPDR13[1:0]	PI IPDR12[1·0]	- 1	2.7	¬	0.100	POPDR IU[1:0]	2.	^	PUPDR8[1:0]		0717	יון אטרט	PUPDR6[1:0]		PI IPDP 5[1:0]		PUPDR4[1:0]	1	0.150	PUPDR3[1.0]	[0:19DB2[1:0]	ויייייייייייייייייייייייייייייייייייייי	[0:116091[4:0]	r Or Div [1.0]	ID-110BUILI-01	י בו היו
Mask	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Value															0	0																

GPIOE Pull-up Pull-down Register MASK Value = 0x00030000 (in HEX)

GPIOE->PUPDR &= \sim(0x00030000);

Alternative solutions:

GPIOE->PUPDR &= \sim(0x03<<16);

GPIOE->PUPDR &= ~GPIO_PUPDR_PUPD8;

4. (2 points) Pin Initialization for Joy Stick

a. Configure PA0 (Center), PA1 (Left), PA2 (Right), PA3 (Up), and PA5 (Down) as Input

Register	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	6	8	7	9	9	4	3	7	7	0
MODER	7.	MODER15[1:0]	MODE B14[1:0]	- 1+1-	~	राज	MODER12[1:0]			MODER11[1:0]	MODER10[1:0]		MODE B0[4:0]	MODERS[1.0]	MODER8[1:0]	[o.,]o.,		MODER/[1:0]	MODE BE[1:0]	MODERAL I.U.	MODE DE [1:0]	MODERAJ[1.0]	MODER4[1:0]		10.136950		MODE B2[1:0]		MODE B4[4:0]	MODELN [1.0]	MODE BOLL OI	ויי.ווטטבעטווי
Mask	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1
Value																					0	0			0	0	0	0	0	0	0	0

GPIOA Mode Register MASK Value = 0x00000CFF (in HEX)

GPIOA->MODER &= \sim (0x00000CFF);

Alternative solution (using constants in C):

GPIOA->MODER &= ~(GPIO_MODER_MODEO | GPIO_MODER_MODE1 | PIO_MODER_MODE2 | GPIO_MODER_MODE3 | GPIO_MODER_MODE5);

b. Configure PA0 (Center), PA1 (Left), PA2 (Right), PA3 (Up), and PA5 (Down) as Pulldown

NO PUPD (00, reset), Pullup (01), Pulldown (10), Reserved (11)

Register	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12		10	6	8	7	9	2	4	3	2	1	0
PUPDR	0	PUPDR15[1:0]	27.7	UPD	. 100.00	rordals[1.0]	PI IPDR12[1:0]	12112	777	PUPUR11[1:0]	70.00	PUPDR10[1:0]		PUPDR9[1:0]	[0:1]8GUGI IG		יייייייייייייייייייייייייייייייייייייי	ח	PI IPDR6[1-0]	יןטיום וי	וויייושםעמו ום		PI IPDR4[1·0]	1		PUPDR3[1:0]	10.175909119	7	27.72	וייין ואטאטא	[0:19DB0[1:0]	FUPURU[1.0]
Mask	0	_			0 0	_	_	0	0	•	0 0	0 0	0	0 0	0 0	0	0	_	_	_	1	1	00	0	1	1 0	1	1 0	1	1 0	1	1
Value																					1	0			1	0	1	0	1	0	1	0

In this case, you need two masks: one to clear bits 11, 10, 7, 6, 5, 4, 3, 2, 1 and 0, and another to set bits 11, 7, 5, 3, and 1. It is also possible to clear only bits 10, 6, 4, 2 and 0. GPIOE Pull-up Pull-down Register MASK Value = 0x00000CFF and 0x000008AA (in HEX)

Alternative solution:

GPIOA->PUPDR &= ~(GPIO_PUPDR_PUPD0 | GPIO_PUPDR_PUPD1 | GPIO_PUPDR_PUPD2 | GPIO_PUPDR_PUPD3 | GPIO_PUPDR_PUPD5);

GPIOA->PUPDR |= (GPIO_PUPDR_PUPD0_1 | GPIO_PUPDR_PUPD1_1 | GPIO_PUPDR_PUPD2_1 | GPIO_PUPDR_PUPD3_1 | GPIO_PUPDR_PUPD5_1);