Pre-lab Assignment 5

Due: Wed, 07 Oct 2020 23:59:59 (approximately 64 days ago)
[Score: 12 / 15 points possible]

For this lab experiment, you will use assembly language to configure the GPIO ports, build interrupt service routines (ISRs), initialize timers, and handle debouncing of keys in a different way than in lab experiments 3 and 4.

Academic Integrity Statement [0 ... -100 points]

By typing my name, below, I hereby certify that the work on this prelab is my own and that I have not copied the work of any other student (past or present) while completing it. I understand that if I fail to honor this agreement, I will receive a score of zero for the lab, a one letter drop in my final course grade, and be subject to possible disciplinary action.

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(1) [1 point]

What value should be written to a timer's PSC (prescaler) register to divide the input clock by 100? **(Nota Bene: "100" is not the right answer.)**

99 

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(2) [1 point]

What is the largest divisor that the timer 6 prescaler can divide the clock by. (And this is also not the largest value you can write to the PSC register.)

65536 

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(3) [1 point]

Assume that a timer has an input clock of 48MHz, and its prescaler is set to divide by 3000. What value should be written to the auto-reload register (ARR) cause an update event exactly once every second? **(Remember: A value that is evenly divisible by 100 will be an incorrect value.)**

15999 

(4) [1 point]

Assume that a timer has an input clock of 48MHz, and its prescaler is set to divide by 60000. What is the longest update event period, in seconds, that can be set by writing a value into the ARR? State your answer to three decimal places.

81.919

(5) [1 point]

How many bits wide are the PSC, ARR, and CNT registers for timer 6?

16

(6) [1 point]

In what control register should a bit be written to enable the (48MHz) system clock that goes to timer 6? (Write its symbolic CMSIS name.)

RCC_APB1ENR

(7) [1 point]

What bit of the register in the previous question should be set to 1 to enable the system clock for timer 6? (Write its symbolic CMSIS name.)

TIM6EN

(8) [1 point]

Write a short assembly language segment to enable the system clock to timer 6. You should create .equ definitions for each symbolic name that you use.

```
.cpu cortex-m0
.thumb
.syntax unified
.fpu softvfp

.equ RCC, 0x40021000
.equ RCC_APB1ENR, 0x1C
.equ TIM6EN, 0x10

.text
.global main
main:
        ldr r0,=RCC
        ldr r1,[R0,#RCC_APB1ENR]
        ldr r2,=TIM6EN
        orrs r1,r2
        str r1,[r0,#RCC_APB1ENR]
        bx lr
```

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(9) [1 point]

Write a short assembly language segment that will enable the Timer 6 to raise an interrupt in the NVIC. You should create .equ definitions for each symbolic name that you use.

```
.cpu cortex-m0
.thumb
.syntax unified
.fpu softvfp

.equ TIM6, 0x40001000
.equ TIM6_DIER, 0xc
.equ TIM_DIER_UIE, 1<<0

.text
.global main
main:
        ldr r0,=TIM6
        ldr r1,[r0,#TIM6_DIER]
        ldr r2,=TIM_DIER_UIE
        orrs r1,r2
        str r1,[r0,#TIM6_DIER]
        bx lr
```

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(10) [1 point]

Type the exact name of the interrupt service routine for timer 6 when using the STM32 Standard Peripheral firmware.

TIM6_DAC_IRQHandler 

(11) [1 point]

If a timer is configured so that its PSC register is 5 and its ARR register is 0, how many times per second will it generate an *update event* if the system clock rate is 48 MHz? (You read the entire lab document, right?)

8000000

(12) [1 point]

Which two pins of the keypad are electrically connected when the '8' button is pressed? (List them in the form Row*X* and Col*Y*.

Row3 and Col2

(13) [1 point]

For the TDCR1050M 4-digit common-anode 7-segment display, the digits are named, from left-to-right D1, D2, D3, and D4. Which pin numbers are used to illuminate the 'B' segment of digit D3? List them as anode , cathode.

PC10 , PC1

(14) [1 point]

For the 74HC138 3-to-8 decoder with active-low outputs, if 3V is connected to pin 16, 0V is connected to pin 8, and pins 1-6 are wired as follows:

- Pin 1: low
- Pin 2: low
- Pin 3: low
- Pin 4: low
- Pin 5: low
- Pin 6: low

which output pins, if any are driven low? (List them with their "Yx" name or "none" if there are no pins driven low.)

none

(15) [1 point]

For the 74HC138 3-to-8 decoder with active-low outputs, if 3V is connected to pin 16, 0V is connected to pin 8, and pins 1-6 are wired as follows:

- Pin 1: low
- Pin 2: high
- Pin 3: high
- Pin 4: low
- Pin 5: low
- Pin 6: high

which output pins, if any are driven low? (List them with their "Yx" name or "none" if there are no pins driven low.)

Y6