CE2107 Lab3 Assignment Sheet (to be submitted to NTULearn before next lab)

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1. Section 6. Other than the procedures outlined in the introduction of Exception Handling, what other registers need to be noted when using the Exception Handling System in ARM Cortex M4F processor? Think global…

PRIMASK and BASEPRI

1. Section 6.2. The bump switch used in the lab is shown below. Pin 1 and 3 of the bump switch are connected to the MSP432. Draw the internal circuit of the bump switch and describe how the MSP432 GPIO can be used to detect that the switch is closed?

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| --- | --- |
|  |  |

Chart

Description automatically generated

When the switch is not pressed, the circuit remains open, and current flows from 5v source to the pullup resistor and into the input pin. Resulting in Input Pin logic “1”

When the switch is pressed, the circuit is closed, hence current flows into ground, pulling current away from input pin resulting in the pin reading of logic “0”

1. Section 6.3. Write down the GPIO configuration used for pins connected to the Bump switches.

P4->SEL0 &= ~(0xED);

P4->SEL1 &= ~(0xED);

P4->DIR &= ~(0xED);//clear

P4->REN |= 0xED;

P4->OUT |= 0xED;//pull up resistor

1. Section 6.3. What is the frequency of the clock source of systick timer? Explain how systick timer is configured to interrupt the system at 1000Hz frequency. Illustrate with detail calculations and APIs used.

Systick time derives from CPU Clock that is kept at 48MHz by the API called Clock\_Init48MHz(). The systick timer interrupt happens when its reload register counts down to 0. The number of times systick handler is called per sec = frequency / amount of time that the period is above API SystickInit is counted to 0. Hence, 48MHz/48000=1000 times

1. Section 6.3. What is the advantage the method of reading Reflectance sensor (in Lab3 section 6.3) has compared to the method used in Lab2?

One advantage is that we don’t need to include a spin loop in the main code to keep reading the Reflectance sensor(CPU is not doing useful work during spin loop), where else by using a Systick Timer, we can read the reflectance value every 1ms when it is interrupted, hence freeing up the CPU. In between outputting of IR, and reading of the IR values, the CPU is free to perform other task while waiting for capacitor to discharge.

1. Section 6.4. Reference to PWM\_Init34() in PWM.c, what is the timer base clock used to increment the counters in Timer\_A0? Show the details of how this base clock of Timer\_A0 is derived, starting from processor clock. Note that SMCLK=12Mhz.

Ans: SMCLK at 12Mhz divided by 8 which is 1.5Mhz.

1. Section 6.5. What is the PWM frequency generated to the motor? illustrate with detail working.

Diagram, engineering drawing

Description automatically generated

1. Section 6.5. Is interrupt mechanism used in the PWM generation via Timers?

No//idk PLS CHECK GONNA SEEK HALP

1. Section 6.5. What is the IRQ number corresponding to the interrupt used by Timer\_A1 in Lab3\_TimerCompare\_Motor project use? What is the corresponding Exception number?

TimerA1 interrupt is interrupt input 10. Hence IRQ number 10 is used and need configuration via ISER0 register which corresponds to exception number 16+10=26 , since external interrupts start with an offset of 16)