**CG2271 Real Time Operating Systems**

**Lab 2 – General Purpose I/O**

**Answer Book**

**IMPORTANT:** YOU MUST PRINT OUT THE COMPLETED ANSWER BOOK AND BRING IT TO YOUR NEXT LAB SESSION!

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Question 1

|  |  |  |
| --- | --- | --- |
| Arduino Digital Pin | Atmega328 port (e.g. PORTB, etc) | Bit number (e.g. 2) |
| 10 | PORTB | 2 |
| 11 | PORTB | 3 |

Question 2

The code to properly set the pins is shown below. (Note: **2 marks will be deducted** if you change any bits other than the relevant bits.)

DDRB | = 0b00000100; // set output

DDRB &= 0b11110111; // set input

Question 3

My code is pasted below. Note: **6 marks will be deducted** if you change more bits in a port than is necessary. E.g. if you do PORTB=0b00000001 when you mean to set only bit 0 to “1” and are supposed to leave the other 7 bits alone.

#define F\_CPU 16000000

#include <avr/io.h>

#include <util/delay.h>

int buttonVal = 0;

void ledOn(){

PORTB |= 0b00000100;

}

void ledOff(){

PORTB &= 0b11111011;

}

void ledBlink(int blink\_times){

int delay = 1000/blink\_times/2;

ledOn();

\_delay\_ms(delay);

ledOff();

\_delay\_ms(delay);

}

int main(){

DDRB |= 0b00000100; // set output

DDRB &= 0b11110111; // set input

while(1){

buttonVal = (PINB & 0b00001000); // read input

if(buttonVal){

ledBlink(4);

} else{

ledBlink(2);

}

}

}

Question 4

|  |  |  |
| --- | --- | --- |
| Arduino Digital Pin | Atmega328 port (e.g. PORTB, etc) | Bit number (e.g. 2) |
| 2 | PORTD | 2 |
| 3 | PORTD | 3 |
| 4 | PORTD | 4 |
| 13 | PORTB | 5 |

Question 5

My code is pasted below. Note: **7 marks will be deducted** if you change more bits in a port than is necessary. E.g. if you did DDRB=0b00000011 when you are only supposed to set bits 0 and 1 to OUTPUT and leave the rest of the bits alone.

void setDS(int isHigh){

if(isHigh){

PORTD |= 0b00000100; // Set DS bit to be high

} else{

PORTD &= 0b11111011; // Set DS bit to be low

}

}

void writeLED(uint8\_t num){

int i;

// set ST\_CP to be low

PORTD &= 0b11101111;

// set DS alternatively

for(i=0;i<8;i++){

setDS(num&1);

num >>= 1;

// set SH\_CP to be high

PORTD |= 0b00001000;

//\_delay\_ms(1);

// set SH\_CP to be low

PORTD &= 0b11110111;

}

// set ST\_CP to high

PORTD |= 0b00010000;

}

Question 6

My code is pasted below.

int i;

while(1){

for(i = 0;i < 255; i++){

writeLED(i);

\_delay\_ms(250);

}

}

Question 7

I have made the following modifications.

Add in the part to read input from Pin 13 to check if the button is pressed.

My Code:

while(1){

for(i = 0;i < 255; i++){

writeLED(i);

if(PINB & 0b00100000){

\_delay\_ms(500);

}else{

\_delay\_ms(250);

}

}

}

Demo:

|  |  |  |
| --- | --- | --- |
| Item | Max Marks | Marks Allocated |
| LED flashes correct binary code | 2 |  |
| All 8 LEDs flash when button pressed | 2 |  |
| Flash rate is correct | 1 |  |
| **Total:** | |  |

Total Marks: \_\_\_\_\_\_\_\_\_\_/50