***Practical 2B: Introduction to C - Decimal to radix-n converter***

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**Practical Group:** Group 2

**Practical Venue:** Red Lab

**Date:** 21st April 2018

**Plagiarism Declaration**

1. I know that plagiarism is wrong. Plagiarism is to use another’s work and pretend that it is one’s own.

2. I have used the IEEE convention for citation and referencing. Each contribution to, and quotation in, this practical report from the work(s) of other people has been attributed and has been cited and referenced.

3. This practical report (including circuit diagrams and code) is my own work.

4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as their own work.

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21st April 2018

Signature Date

***SOLUTIONS***

**(a)** The LEDs are connected to:

PB0, PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB10, PB11 // PB = PortB

**(b)** The code outputs the following text:

EEE2046F Prac 2B

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**(c)** **GPIOB->MODER** means that we are accessing the MODER Register which is stored in the

structure by dereferencing the pointer GPIOB

**(d)** i) This will set the 17th bit from the Least Significant Bit (LSB) to 1 on the member

AHBENR of the structure. This is done to enable the clock for port A

ii) This changes the MODER Register referenced by the GPIOB pointer to set all GPIO pins

connected to the LEDs in digital output mode

iii) This sets the ODR Register referenced by the GPIOB pointer to set PB0, PB1, PB2, PB3

and PB10 to HIGH. Ie: sets the first 4 red LEDs on and the RG LED to red

**(e)** (RCC\*).AHBENR = (RCC\*).AHBENR | 1<<17;

**(f)** The code inverts the bits in the ODR followed by a short delay

**(g)**

**#include** "lcd\_stm32f0.h"

**#include** "stm32f0xx\_conf.h"

**void** init\_GPIOB(**void**);

**void** main (**void**)

{

init\_GPIOB();

init\_LCD(); // Initialise lcd

lcd\_putstring("RONAK MEHTA"); // Display string on line 1

lcd\_command(LINE\_TWO); // Move cursor to line 2

lcd\_putstring("MHTRON001"); // Display string on line 2

**for**(;;)

{

GPIOB->ODR = ~GPIOB->ODR;

**for** (**int** i = 0 ;i<=100;i++)

**for**(**int** j = 0;j<=5000;j++);

} // Loop forever

} // End of main

**(h)**

#define DELAY1 1000

#define DELAY2 3000

void Delay(void)

{

int i,j;

for(i=0; i<=DELAY1; i++)

for(j=0; j<=DELAY2; j++);

}

**(i)**

i) uint8\_t bitpattern1 = 0;

ii) uint8\_t bitpattern2 = 0b11111111;

iii) uint8\_t bitpattern3 = 0b10101010;

**(j)**

**#include** "lcd\_stm32f0.h"

**#include** "stm32f0xx\_conf.h"

**#include** <stdint.h>

//====================================================================

// SYMBOLIC CONSTANTS

//====================================================================

**int** DELAY1 = 1000;

**int** DELAY2 = 3000;

uint8\_t bitpattern1 = 0;

uint8\_t bitpattern2 = 0b11111111;

uint8\_t bitpattern3 = 0b10101010;

//====================================================================

// GLOBAL VARIABLES

//====================================================================

// FUNCTION DECLARATIONS

//====================================================================

**void** **init\_GPIOB**(**void**);

**void** **Delay**(**void**);

//====================================================================

// MAIN FUNCTION

//====================================================================

**void** **main** (**void**)

{

init\_GPIOB();

init\_LCD(); // Initialise lcd

lcd\_putstring("RONAK MEHTA"); // Display string on line 1

lcd\_command(LINE\_TWO); // Move cursor to line 2

lcd\_putstring("MHTRON001"); // Display string on line 2

**for**(;;)

{

GPIOB->ODR = bitpattern1; // Turns all LEDs off

Delay(); // Delays for 1 second

GPIOB->ODR = bitpattern2; // Turns all LEDs On

Delay(); // Delays for 1 second

GPIOB->ODR = bitpattern3; // Alternatives LEDs from on to off

Delay(); // Delays for 1 second

} // Loop forever

} // End of main

//====================================================================

// FUNCTION DEFINITIONS

//====================================================================

**void** **init\_GPIOB**(**void**)

{

RCC ->AHBENR |= 1<<18;

GPIOB->MODER |= 0x00505555;

GPIOB->ODR = 0b0000010000001111;

}

**void** **Delay**(**void**){

**for**(**int** i=0; i<DELAY1; i++){

**for** (**int** j = 0; j < DELAY2; ++j) {

}

}

}

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

// END OF PROGRAM

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**(k)**

**#include** "lcd\_stm32f0.h"

**#include** "stm32f0xx\_conf.h"

**#include** <stdint.h>

//====================================================================

// SYMBOLIC CONSTANTS

//====================================================================

**int** DELAY1 = 1000;

**int** DELAY2 = 3000;

uint8\_t bitpattern1 = 0;

uint8\_t bitpattern2 = 0b11111111;

uint8\_t bitpattern3 = 0b10101010;

uint8\_t bitpatternx = 1;

//====================================================================

// GLOBAL VARIABLES

//====================================================================

// FUNCTION DECLARATIONS

//====================================================================

**void** **init\_GPIOB**(**void**);

**void** **Delay**(**void**);

//====================================================================

// MAIN FUNCTION

//====================================================================

**void** **main** (**void**)

{

init\_GPIOB();

init\_LCD(); // Initialise lcd

lcd\_putstring("RONAK MEHTA"); // Display string on line 1

lcd\_command(LINE\_TWO); // Move cursor to line 2

lcd\_putstring("MHTRON001"); // Display string on line 2

**for**(;;)

{

**if** (bitpatternx == 65535) { // ODR has 16 subpins. 2^16 = 65536

**break**; // So max value will be 65536-1 =65535

}

GPIOB->ODR = bitpatternx; // Giving ODR value of bitpatternx

bitpatternx++; // Incrementing bitpatternx by 1

Delay(); // Gives a 1 second delay

}

}

//====================================================================

// FUNCTION DEFINITIONS

//====================================================================

**void** **init\_GPIOB**(**void**)

{

RCC ->AHBENR |= 1<<18;

GPIOB->MODER |= 0x00505555;

GPIOB->ODR = 0b0000010000001111;

}

**void** **Delay**(**void**){

**for**(**int** i=0; i<DELAY1; i++){

**for** (**int** j = 0; j < DELAY2; ++j) {

}

}

}

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

// END OF PROGRAM

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**(l) and (m)**

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**int** DELAY1 = 1000;

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uint8\_t bitpattern1 = 0;

uint8\_t bitpattern2 = 0b11111111;

uint8\_t bitpattern3 = 0b10101010;

uint8\_t bitpatternx = 1;

//====================================================================

// GLOBAL VARIABLES

//====================================================================

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// FUNCTION DECLARATIONS

//====================================================================

**void** **init\_GPIOB**(**void**);

**void** **Delay**(**void**);

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// MAIN FUNCTION

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**void** **main** (**void**)

{

init\_GPIOB();

init\_LCD(); // Initialise lcd

lcd\_putstring("RONAK MEHTA"); // Display string on line 1

lcd\_command(LINE\_TWO); // Move cursor to line 2

lcd\_putstring("MHTRON001"); // Display string on line 2

**for**(;;)

{

**if** (bitpatternx == 0) // Once bitpatternx value reaches 0

{ // It resets to 1 and continues the loop

bitpatternx = 1;

}

GPIOB->ODR = bitpatternx; // Giving ODR value of bitpatternx

bitpatternx = bitpatternx<<1; // Shifting 1 value to the left

Delay(); // Gives a 1 second delay

} // Loop Forever

} // End of main

//====================================================================

// FUNCTION DEFINITIONS

//====================================================================

**void** **init\_GPIOB**(**void**)

{

RCC ->AHBENR |= 1<<18;

GPIOB->MODER |= 0x00505555;

GPIOB->ODR = 0b0000010000001111;

}

**void** **Delay**(**void**){

**for**(**int** i=0; i<DELAY1; i++){

**for** (**int** j = 0; j < DELAY2; ++j) {

}

}

}

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

// END OF PROGRAM

//\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*