

EEE2046F Pre-Practical 4

1. Using the [schematic](#) for the UCT STM32F0 Development Board, identify which General Purpose Input/Output port(s) AND pins that the user controlled LEDs are connected to on the UCT STM32F0 Development Board.

Answer:

Pin Number	Port Label GPIO
18 [LED D0]	GPIOPB0
19 [LED D1]	GPIOPB1
20 [LED D2]	GPIOPB2
21 [LED D9R]	GPIOPB10
22 [LED D9G]	GPIOPB11
39 [LED D3]	GPIOPB3
40 [LED D4]	GPIOPB4
41 [LED D5]	GPIOPB5
42 [LED D6]	GPIOPB6
43 [LED D7]	GPIOPB7

2. Name all the Reset and Clock Control (**RCC**) and General Purpose Input Output (GPIO) registers which need to be modified to correctly configure the digital output operation of the ports connected to the user controlled LEDs on the UCT STM32F0 Development Board.

Answer:

Bit 18 of the RCC->AHBENR needs to be set to "1" to enable clock to GPIOB. GPIOB->MODER bits [0,2,4,6,8,10,12,14,20,22] need to be set to "1" to change the configuration to output. GPIOB->ODR = 0x000000FF to change configuration to output/high.

3. Using the schematic for the UCT STM32F0 Development Board at the end of the practical sheet, identify which General Purpose Input/Output port(s) AND pins the user controlled Normally Open (N.O.) push buttons are connected to on the UCT STM32F0 Development Board.

Answer:

Port A (PA): PA0, PA1, PA2, PA3

Pins 10, 11, 12, 13

4. Name all the Reset and Clock Control (RCC) and **General Purpose Input Output (GPIO) registers** which need to be modified to correctly configure the digital input operation of the ports connected to the user controlled push buttons on the UCT STM32F0 Development Board.

Answer:

Bit 17 of the RCC->AHBENR needs to be set to 1 to enable the clock for GPIOA. (Since they are set to this on reset, they DON'T need to be changed from reset but I included it for completeness-sake.)

Bits 0,1,2,3,4,5,6,7 of the GPIOA->MODER need to be set to 00 to configure them to input mode.

The GPIOA->PUPDR pins 0-3 need to be set to 01 to enable the pull up resistors.

The GPIOA->IDR bits 10,11,12,13 need to be set to 1 for the 4 buttons at pins 10,11,12,13 [GPIOA0-3].

5. Explain in detail what this C statement is shorthand for GPIOB->MODER.

Answer:

The statement GPIOB->MODER is equivalent to “(*GPIOB).MODER”. It is using a pointer to access the Mode Register (MODER) in the GPIO structure, which is a memory-mapped register. Or a pointer to a structure mapping to the GPIOB control registers. The “->” operator is used to access the member of a structure using a pointer to the structure. Therefore, GPIOB->MODER points to the memory location of the MODER register in the GPIOB structure. MODER is one member of the GPIOB register structure.

6. Explain what each of the following lines of code do when run on a the UCT STM32 Development Board, using the Reference sheet at the end of this manual for guidance.

1. `RCC->AHBENR |= 1<<18;`
2. `GPIOB->MODER |= 0x00505555;`
3. `GPIOB->ODR = 0b0000010000001111;`

Answer:

The statement `RCC->AHBENR |= 1<<18;` sets the bit 18 of the AHB Peripheral Clock Enable Register (AHBENR) by performing a bitwise OR operation with a value of 1 shifted left by 18 bits. This enables the clock to the peripheral connected to bit 18 of the AHBENR register, which in this case is the GPIOB peripheral. The AHBENR register is part of the Reset and Clock Control module (RCC), which is responsible for managing the clock signals of various peripherals in the microcontroller.

The statement `GPIOB->MODER |= 0x00505555;` sets the MODER register of GPIOB to configure the pins PB0, PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB10, and PB11 to operate in output mode. The value 0x00505555 is a hexadecimal number that corresponds to the binary value of 0000 0000 0101 0000 0101 0101 0101 0101 in binary. This value sets the bits 0, 2, 4, 6, 8, 10, 12, 14, 20, and 22 of the MODER register to 1, which corresponds to the output mode.

The statement `GPIOB->ODR = 0b0000010000001111;` points to the Output Digital Register (ODR) of GPIOB. Since bits 0,1,2,3,10 is set to 1, this pointer will allow the programmer to either read or write the values of ODR0, ODR1, ODR2, ODR3 and ODR10 and hence PB0-3 and PB10. And since these bits are set to 1, this line of code will turn on LEDS D0, D1, D2, D3 and D10.

7. Write `RCC->AHBENR |= 1<<18;` in two alternative ways which produce the same effect on the STM32F051 microcontroller.

Answer:

1. `RCC->AHBENR |= RCC_AHBENR_GPIOBEN;`
2. `RCC->AHBENR |= 0b00000000000001000000000000000000;`

8. Read through the questions in the Questions and Coding section of the practical sheet and draw a flow chart which describes the FULL final program operation. Upload a pdf version of this to the pre-practical quiz on Amathuba.

Answer:

See Next Page

Prac 4 FLOW CHART

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