



Bioelectronics and Measurements (ARM Part) Term Exam **Solution** – 2013

Solve as Much as You Can – Maximum Grade for Both Parts 1 and 2: 75 Points

Part I. Complete the following sentences [1 point each]:

1. On the VLDISCOVERY kit with DAC configured as 12-bit mode and DOR=1000, the DAC output will be $1000 \times 3.3 / 4096$... volt.
2. A prescaler value of 0 in TIM5 divides the counter clock frequency by a factor of ... 1
3. Selecting the Up/Down counting modes of TIM2 is done by writing to ... CMS bits[0:1] in TIM2_CR1
4. To use a GPIO pin to drive a load at high current, it is configured to work in ... OPEN-DRAIN output mode
5. Output DAC voltage is available after the value of DHR changes by a period of ... 1 APB1 clock cycle + t_{settling}
6. Changing the auto-reload register value in TIM4 takes effect after UPDATE EVENT... when ARPE=1.
7. After an enabled System Tick Timer interrupt occurrence, the system starts executing code from address ... 0x0000_003C (interrupt vector)
8. In TIM3, counter is clocked by prescaler output only when ... CEN in TIM3_CR1 Register bit is set.

Part II. Mark the following statements as True (T) or False (F) [1 point each]:

9. It is possible to configure the STM32 ARM processor to boot from a USB flash memory. (F)
10. It is possible to disconnect the internal supply of ARM peripherals that are not used to save power. (T)
11. The DAC modules can work independently. (T)
12. It is possible to mask TIM3 overflow interrupt. (T)
13. It is possible to use Timer 1 overflow as the trigger to the DAC module. (F)
14. An interrupt request can also be generated by software by writing a '1' in the software interrupt register. (T)
15. It is possible to configure EXTI to receive external interrupts from both PA1 and PC1 simultaneously. (F)
16. SysTick timer can be reconfigured by software after booting. (T)
17. All interrupts are disabled after power on reset. (F)
18. General purpose timers TIM2-5 can have different clock sources independently. (T)

Part III. Answer the following problem:

19. [8 points] Design an ARM project for your VLDISCOVERY kit that detects a user button press to activate a LED and producing an analog voltage of 1.5 V for 3 seconds before returning to original state. In particular, write the steps that allow the following:
 - a. Configuring the GPIO connected to the User Button input. Project #1 Q6
 - b. Configuring a GPIO connected to a LED as output in a suitable mode. Project #1 Q2
 - c. Configuring the DAC module to generate a voltage of 1.5 volts. Project #5 Q2
 - d. Configuring a timer to generate an event at 3 s once (general purpose timer, SysTick, etc.).
Use General Purpose Timers as Project #4 Q4 or SysTick Timer as Project #3 Q2

Please feel free to write the programming steps as pseudo-code or a list that is not necessarily a C code.

Best of luck!