Continuing Education Course #507
Microcontrollers - Design and Implementation

1. The following components are all design considerations when designing a microcontroller-based system except
- a. the registers
- b. microcontroller
- c. compiler
- d. device programmer

2. The following parameters need to be considered when selecting a microcontroller for a system of any complexity: power consumption, processor bus width, peripheral selection, processor speed, and
- a. temperature
- b. humidity
- c. the amount of program memory and data memory
- d. barometric pressure

3. The purpose of using a compiler (such as one that compiles programs written in the C programming language) is
- a. to make the software code as small as possible
- b. to complicate program maintenance issues
- c. to prevent the developer from having to use processor-specific assembly code instructions
- d. to make the processor run faster

4. The program counter is the register that contains the program address of the current instruction being executed. Using the interrupt vector table for the ATtiny2313A in the course the value of the program counter immediately after a "Timer/Counter0 Compare Match A" interrupt fires is
- a. 0x0000
- b. 0x0001
- c. 0x000C
- d. 0x000D

5. The term reduced instruction set computer (RISC) when compared to an x86-based processor implies that it
- a. has fewer yet more powerful instructions
- b. is not as powerful as an x86-based processor (running at the same speed)
- c. is smaller in size
- d. consumes more power

6. The Harvard architecture employs a computer architecture
- a. in which program memory and data memory exist in the same memory space
- b. that uses more registers
- c. in which program memory and data memory can be accessed simultaneously
- d. that employs longer bus lines

7. The Harvard architecture interfaces the core to program memory and data memory

- a. on another circuit board
- b. on separate busses
- c. without a bus
- d. on the same bus

8. The ALU performs the following operations:
- a. timing
- b. memory
- c. switching
- d. arithmetic and logic

9. The following technique is the fastest way to signal the processor that a peripheral needs servicing.
- a. polling
- b. using an interrupt
- c. scaling
- d. instructing

10. The purpose of an interrupt controller is
- a. to allow two or more peripherals to communicate with one another
- b. to copy the stack
- c. to signal the processor that a peripheral needs servicing
- d. to save memory

11. When an interrupt event occurs the following happens:
- a. the peripheral sends a signal to the interrupt controller
- b. the interrupt controller signals the processor that one of the peripherals needs to be serviced
- c. the current state of the processor (program counter and stack) is saved
- d. all of the above

12. The register that sets the direction of the port pins to either input or output is the
- a. special function register
- b. program counter register
- c. data direction register
- d. timer counter register

13. The highest value that the counter register can hold in a 16-bit timer is
- a. 16
- b. 255
- c. 65535
- d. 32767

14. A timer peripheral in a microcontroller can be used as the time basis for the following functions except:
- a. pulse width modulation circuit
- b. task manager for an operating system
- c. periodic servicing of a particular function
- d. LED driver to drive an LED with 100mA of current

15. In the timer compare match mode, when the compare match interrupt is set and the counter register equals the compare register
- a. a compare match interrupt occurs and the counter register is set to zero and resumes counting from zero
- b. a compare match interrupt occurs and the counter register keeps counting from the same value

- ○ c. a compare match interrupt occurs and the counter stops counting
- ○ d. a timer overflow interrupt occurs

16. In the C programming language header files such as the "register.h" header file used in the course projects are used
- ○ a. to make the overall length of the program shorter
- ○ b. to use the same name for constants from one module to another
- ○ c. to assign meaningful names to constants and registers
- ○ d. all of the above

17. An external interrupt in a microcontroller is used to
- ○ a. signal the processor that a timer overflow condition has occurred
- ○ b. signal the processor that an external event has occurred on a port pin such as a button press
- ○ c. signal the processor that the external temperature is over its design limit
- ○ d. all of the above

18. In the second project of the course a timer compare match interrupt will occur when the counter register reaches the following value
- ○ a. 65535
- ○ b. 240
- ○ c. 244
- ○ d. 0

19. To configure a port as an output the bits in the data direction register are set to
- ○ a. one
- ○ b. two
- ○ c. zero
- ○ d. three

20. In the third project in the course the external interrupt service routine is used to
- ○ a. enable the timer output compare match interrupt
- ○ b. initialize the port pins
- ○ c. define the interrupt vector locations
- ○ d. initialize the system