Final Exam - Designing with Microcontrollers

1. The following components are all design considerations when designing a microcontroller-based system: the microcontroller, the compiler, and the device programmer.
    a. true
    b. false

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. Polling a peripheral is much faster than using an interrupt to signal the processor that a peripheral needs servicing.
    a. true
    b. false

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

9. When an interrupt event occurs _____.
    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

10. 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

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

12. A timer peripheral in a microcontroller can be used as the time basis for the following functions except a(n) _____.
    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

13. 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

14. 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

15. 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

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

17. The bits in the data direction register are set to a one to correspond to an output on a port.
    a. true
    b. false

18. 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

19. A typical bus width (or the number of bits that the core can process simultaneously) for a microcontroller is _____.
    a. 10 bits
    b. 67 bits
    c. 8 bits
    d. 1 bit

20. A processor architecture in which program memory and data memory share the same bus (so they cannot be accessed simultaneously) is called the _____.
    a. Harvard architecture
    b. von Neumann architecture
    c. Carnegie architecture

d. Morgan architecture

21. The processor's core (or central processing unit) is responsible for _____.
    a. performing calculations
    b. handling interrupts
    c. accessing program and data memories
    d. all of the above

22. The arithmetic logic unit _____.
    a. performs add, subtract, AND, OR, NOT, and bit shift operations
    b. copies blocks of memory from one location to another
    c. controls the clock
    d. handles interrupts

23. The first vector (or address) within the interrupt vector table is usually the _____.
    a. time overflow interrupt
    b. port interrupt
    c. reset vector
    d. UART receive interrupt

24. A microcontroller can be clocked by either an internal clock (or oscillator) or an external clock.
    a. false
    b. true

25. The address map that is used when an interrupt occurs is called the _____.
    a. register association
    b. instruction decoder
    c. program counter
    d. vector table