

Final Exam – The Basics of Microcontrollers

1. The difference between a microcontroller and a microprocessor is that _____.
 - a. microcontrollers are specialized microprocessors
 - b. microcontrollers sometimes contain internal data and program memory whereas microprocessors usually do not contain any internal memory
 - c. microcontrollers usually contain peripherals such as communication controllers
 - d. all of the above
2. This is a list of all possible instructions that can be interpreted by the CPU. It can be thought of as the processor's vocabulary.
 - a. compiler
 - b. dictionary
 - c. register bank
 - d. instruction set
3. A file containing a series of ones and zeros that is interpreted by the central processing unit that instructs the processor to carry out a series of instructions is called _____.
 - a. the C programming language
 - b. a compiler
 - c. machine code
 - d. an assembler
4. A series of sequential instructions executed by the CPU is called a _____. It is what software engineers write in a higher level language like C/C+.
 - a. memory
 - b. multiplexer
 - c. program
 - d. decoder
5. All of the following are processor architectures except the _____.
 - a. Harvard architecture
 - b. von Neumann architecture
 - c. Babbage architecture
 - d. modified Harvard architecture
6. The differences in the processor architectures discussed in the course focus on _____.
 - a. processor speed
 - b. program memory and data memory access
 - c. the number of transistors
 - d. the number of registers in the core

7. The advantage of a processor designed with a von Neumann architecture is that simultaneous access to program and data are possible.
- true
 - false
8. The main components of the CPU are the following except _____.
- the ALU
 - flash memory
 - the control unit
 - registers
9. The ALU performs _____.
- addition, subtraction, multiplication, division
 - AND, OR, NOT, XOR, bit shifting
 - logical comparisons
 - all of the above
10. A processor incorporating a Harvard architecture contains an address 0x00000000 for program memory and an address 0x00000000 for data memory.
- true
 - false
11. Which of the following characteristics best describes a modified Harvard architecture?
- data memory starts at address 0x00000000 and program memory starts at address 0x00000000
 - program and data memories share the same bus to the CPU
 - the processor has a single address space
 - program memory and data memory must be stored on the same memory device
12. All of the following characteristics describe a processor with a von Neumann architecture except _____.
- the program instructions and data are located in the same memory space
 - code and data can exist in the same memory space
 - one bus is used for both program and data memory
 - one bus is used for program memory and a separate bus is used for data memory
13. The two's complement of -58 is _____.
- 1001 1100
 - 1100 1000
 - 0101 1100
 - 1100 0110

14. To multiply a number by 4 you would _____.
- shift the number left by one bit
 - shift the number right by two bits
 - shift the number left by two bits
 - shift the number left by four bits
15. What best describes the function of the control unit?
- it performs addition and subtraction
 - it performs logical comparisons
 - it performs two's complement on a register
 - it configures the ALU, memory and register bank for a particular operation
16. Half duplex communications means that _____.
- every device has a unique address
 - the device cannot transmit and receive simultaneously
 - the slaves need a chip select
 - the device can transmit and receive simultaneously
17. The _____ communications peripheral is half duplex.
- UART
 - timer
 - SPI
 - I²C
18. Synchronous communications means that _____.
- the slaves need a chip select
 - a clock is sent with the data on a separate line
 - there is a data line but no clock line
 - the communications link is slow
19. The _____ communications peripheral is asynchronous.
- UART
 - SPI
 - port
 - I²C
20. A device that measures elapsed time or controls events during a predetermined interval is called a _____.
- register
 - timer
 - flip-flop
 - GPIO
21. A timer overflow occurs after _____.
- the timer is initialized
 - the ALU completes a move operation

- c. the CPU starts to overheat
 - d. the timer's counter register fills up
22. The name for a temporary storage area for an instruction or piece of data is a _____.
- a. UART
 - b. timer
 - c. register
 - d. byte
23. The _____ cycle governs the CPU's operation.
- a. fetch-decode-execute
 - b. fetch-deliver-execute
 - c. fetch-deliver-program
 - d. program-decode-execute
24. The _____ CPU cycle configures the ALU for a particular operation.
- a. run
 - b. decode
 - c. memory
 - d. deliver
25. The _____ component decodes an instruction from the program code.
- a. clock
 - b. control unit
 - c. ALU
 - d. register
26. General purpose input/output is best described as _____.
- a. a single pin that can be set high or low as an output or can be read as an input
 - b. a UART
 - c. an address bus
 - d. a data bus
27. The _____ has an input frequency of 32768 Hz, does not go to sleep with the processor and may or may not contain an integrated calendar.
- a. universal asynchronous receiver/transmitter
 - b. core
 - c. arithmetic logic unit
 - d. real-time clock
28. The _____ communications peripheral requires a chip select.
- a. UART
 - b. interrupt
 - c. SPI
 - d. I²C

29. The _____ communications peripheral requires the sender (or master) to send the address of the receiver (or slave).
- a. UART
 - b. SPI
 - c. port
 - d. I²C
30. The _____ communications peripheral usually is used in conjunction with a transceiver (such as RS-232 or RS-485) to communicate with a device on another circuit board.
- a. UART
 - b. SPI
 - c. Ethernet
 - d. I²C