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Continuing Education Course #603
Microcontrollers: the Arithmetic Logic Unit

1. Which operation is commonly performed by an ALU?
- a. AND
- b. OR
- c. addition
- d. all of the above

2. In which part of a microcontroller is an ALU located?
- a. power supply
- b. central processing unit
- c. random access memory
- d. interrupt handler

3. What is the control signal of an ALU that selects the function to be performed called?
- a. opcode
- b. operand
- c. status
- d. output

4. What are the two input parameters (usually called A and B) to be operated upon in an ALU called?
- a. opcode
- b. operand
- c. status
- d. output

5. What is the main purpose of an ALU in a CPU?
- a. to store data
- b. to control program execution
- c. to manage threads
- d. to perform arithmetic and logic operations

6. How are negative numbers represented in a microcontroller?
- a. twos' complement
- b. negative numbers are not possible
- c. by shifting one bit to the right
- d. by shifting one bit to the left

7. Floating point operations are performed in a
- a. floating point unit
- b. full adder

○ c. multiplexer
○ d. instruction decoder

8. The 74181 medium-scale integration integrated circuit developed and used in the 1970s as the first single-chip ALU can do operations on what sized operands?
○ a. 2-bit
○ b. 4-bit
○ c. 8-bit
○ d. 16-bit

9. What is a typical operation performed by an ALU?
○ a. interrupt handling
○ b. instruction decoding
○ c. arithmetic addition
○ d. multithreading

10. What is the twos' complement of decimal 47?
○ a. 0110 1001
○ b. 1101 0001
○ c. 0010 1111
○ d. 1010 0110

11. Logic operations that allow for the manipulation of data, such as setting, clearing, bit flipping, and masking bits are fundamental for tasks for all of these except
○ a. data encoding and decoding
○ b. encryption and decryption
○ c. error detection and correction
○ d. storing data

12. Multiplication and division by powers of two may be accomplished by
○ a. addition
○ b. subtraction
○ c. bit shifting
○ d. using an inverter

13. What is the function of the control lines of an ALU?
○ a. to store the result in memory
○ b. to select the operation to be performed
○ c. to pause the operation
○ d. to clear the inputs

14. Adding two 8-bit numbers may be accomplished by cascading 8
○ a. AND gates
○ b. NAND gates
○ c. D flip flops
○ d. full adders

15. What is the difference between a half adder and a full adder?
○ a. a full adder has a carry-in bit
○ b. a half adder has a carry-in bit

○ c. they are both the same
○ d. a half adder does not have a carry-out bit

16. What is the purpose of the carry-in bit in a full adder?
○ a. to clear the adder
○ b. to invert the result
○ c. to take a carry bit from another stage
○ d. to indicate that the result has overflowed

17. In an arithmetic right shift
○ a. the least significant bit is lost and the most significant bit is lost
○ b. the least significant bit is lost and the most significant bit is copied
○ c. the least significant bit is copied and the most significant bit is lost
○ d. the least significant bit is copied and the most significant bit is copied

18. The 74181 ALU integrated circuit has how many logic gates?
○ a. 100
○ b. 75
○ c. 22
○ d. 25

19. The 74181 ALU is capable of doing a total of how many arithmetic and logic functions?
○ a. 4
○ b. 8
○ c. 16
○ d. 32

20. Which type of operations can the 74181 perform?
○ a. arithmetic operations only
○ b. memory addressing operations
○ c. both arithmetic and logical operations
○ d. graphics operations

21. How many function select lines (not including the mode line) does the 74181 have to specify its operations?
○ a. 2
○ b. 4
○ c. 8
○ d. 16

22. The purpose of the carry input line (Cn) input in the 74181 ALU is
○ a. to provide a carry input for addition from another adder stage
○ b. to invert the output
○ c. to indicate a subtract operation
○ d. to shift the bits left

23. The M input control line on the 74181 ALU
○ a. provides a carry input from another stage
○ b. inverts the output
○ c. selects between addition and subtraction
○ d. switches between arithmetic and logic modes

24. The S select lines on the 74181 ALU
- a. select the operation
- b. select the output sign
- c. sets the clock rate
- d. sets the memory width

25. In the 74181 ALU, a logic operation is performed when the mode input (M) is set to
- a. 0
- b. 1
- c. 2
- d. 3

26. Which gate has functional completeness, meaning any combinational logic function can be realized by using only this type of gate?
- a. AND
- b. OR
- c. XOR
- d. NAND

27. The number of control lines that form the opcode will dictate
- a. size of the memory
- b. the number of operations that the ALU can perform
- c. the speed at which the ALU will execute its operations
- d. size of the operands

28. The method of performing subtraction in the ALU is by what method?
- a. bit shifting
- b. bit masking
- c. twos' complement
- d. subtraction is not possible

29. The block of logic that allows an ALU to perform addition is called a what?
- a. decoder
- b. full adder
- c. multiplexer
- d. demultiplexer

30. A compiler translates a series of instructions from a higher level language into a file containing a series of ones and zeros called what?
- a. data
- b. data set
- c. memory
- d. machine code