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**AI18C**

**CEA201**

**Part 1: Knowledge Base (5 points)**

1. What are the typical elements of a machine instruction?

\_Operation code. (specifies the op. to be performed.)  
\_Source and destination operand references. (specify the input and output locations for the op.)  
\_Next instruction references.(which is usually implicit)

1. List and briefly explain five important instruction set design issues

\_Operation repertoire. (how many and which op. to provide and how complex op. should be.)  
\_Data types. (various types of data upon which op. are performed)  
\_Instruction format. (Inst. length, number of addresses, size of various fields, and so on.)  
\_Registers. (no. of CPU registers that can be ref. by inst. and their use)  
\_Addressing. (the mode or modes by which the address of an operand is specified)

1. What is the difference between an arithmetic shift and a logical shift?

\_With a logical shift, the bits of a word are shifted left or right. On one end, the bit  
shifted out is lost. On the other end, a 0 is shifted in. The arithmetic shift operation  
treats the data as a signed integer and does not shift the sign bit.

1. Briefly define displacement addressing

\_Displacement addressing: The instruction has two address fields, at least one of  
which is explicit. The value contained in one address field (value = A) is used  
directly. The other address field refers to a register whose contents are added to A  
to produce the effective address.

1. What are the advantages and disadvantages of using a variable-length instruction format?

\_Advantages: It easy to provide a large repertoire of opcodes, with different  
opcode lengths. Addressing can be more flexible, with various combinations of  
register and memory references plus addressing modes.  
  
\_Disadvantages: an increase in the complexity of the CPU.

**Part 2: Multiple Choice (5 points)**

1. The operand \_\_\_\_\_\_\_\_ yields true if and only if both of its operands are true.

A. XOR B. OR

C. AND D. NOT

2. The operation \_\_\_\_\_\_\_\_\_ yields true if either or both of its+ operands are true.

A. NOT B. AND

C. NAND D. OR

3. The unary operation \_\_\_\_\_\_\_\_\_ inverts the value of its operand.

A. OR B. NOT

C. NAND D. XOR

4. A \_\_\_\_\_\_\_ is an electronic circuit that produces an output signal that is a simple Boolean operation on its input signals.

A. gate B. decoder

C. counter D. flip-flop

5. \_\_\_\_\_\_\_\_ are used in digital circuits to control signal and data routing.

A. Multiplexers B. Program counters

C. Flip-flops D. Gates

6. Counters can be designated as \_\_\_\_\_\_\_\_\_.

A. asynchronous

B. synchronous

C. both asynchronous and synchronous

D. neither asynchronous or synchronous

1. There must be \_\_\_\_\_\_\_\_ instructions for moving data between memory and the registers.

A. branch B. logic

C. memory D. I/O

1. \_\_\_\_\_\_\_\_ instructions operate on the bits of a word as bits rather than as numbers, providing capabilities for processing any other type of data the user may wish to employ.

A. Logic B. Arithmetic

C. Memory D. Test

1. \_\_\_\_\_\_\_\_\_ instructions provide computational capabilities for processing number data.

A. Boolean B. Logic

C. Memory D. Arithmetic

1. The most fundamental type of machine instruction is the \_\_\_\_\_\_\_\_\_ instruction.

A. conversion B. data transfer

C. arithmetic D. logical

1. Which of the following is a true statement?
2. a procedure can be called from more than one location
3. a procedure call can appear in a procedure
4. each procedure call is matched by a return in the called program
5. all of the above
6. The entire set of parameters, including return address, which is stored for a procedure invocation is referred to as a \_\_\_\_\_\_\_\_\_.

A. branch B. stack frame

C. pop D. push

1. Which ARM operation category includes logical instructions (AND, OR, XOR), add and subtract instructions, and test and compare instructions?

A. data-processing instructions B. branch instructions

C. load and store instructions D. extend instructions

1. In the ARM architecture only \_\_\_\_\_\_\_\_\_ instructions access memory locations.

A. data processing B. status register access

C. load and store D. branch

1. Which data type is defined in MMX?

A. packed byte B. packed word

C. packed doubleword D. all of the above

1. A branch instruction in which the branch is always taken is \_\_\_\_\_\_\_\_\_.

A. conditional branch B. unconditional branch

C. jump D. bi-endian

1. The advantage of \_\_\_\_\_\_\_\_\_\_ is that no memory reference other than the instruction fetch is required to obtain the operand.

A. direct addressing B. immediate addressing

C. register addressing D. stack addressing

1. The principal advantage of \_\_\_\_\_\_\_\_\_\_\_ addressing is that it is a very simple form of addressing.

A. displacement B. register indirect

C. stack D. direct

1. \_\_\_\_\_\_\_\_\_\_ has the advantage of large address space, however it has the disadvantage of multiple memory references.

A. Indirect addressing B. Direct addressing

C. Immediate addressing D. Stack addressing

1. The advantages of \_\_\_\_\_\_\_\_\_ addressing are that only a small address field is needed in the instruction and no time-consuming memory references are required.

A. direct B. indirect

C. register D. displacement

1. \_\_\_\_\_\_\_\_\_\_ has the advantage of flexibility, but the disadvantage of complexity.

A. Stack addressing B. Displacement addressing

C. Direct addressing D. Register addressing

1. For \_\_\_\_\_\_\_\_\_, the address field references a main memory address and the referenced register contains a positive displacement from that address.

A. indexing B. base-register addressing

C. relative addressing D. all of the above

1. Indexing performed after the indirection is \_\_\_\_\_\_\_\_\_\_.

A. relative addressing B. autoindexing

C. postindexing D. preindexing

1. For the \_\_\_\_\_\_\_\_\_ mode, the operand is included in the instruction.

A. immediate B. base

C. register D. displacement

1. Which of the following interrelated factors go into determining the use of the addressing bits?

A. number of operands B. number of register sets

C. address range D. all of the above

1. \_\_\_\_\_\_\_\_\_ is a principle by which two variables are independent of each other.

A. Opcode B. Orthogonality

C. Completeness D. Autoindexing

1. All instructions in the ARM architecture are \_\_\_\_\_\_\_\_\_\_ bits long and follow a regular format.

A. 8 B. 16

C. 32 D. 64

1. With a \_\_\_\_\_\_, the bits of a word are shifted left or right. On one end, the bit shifted out is lost. On the other end, a 0 is shifted in.

A. Logical shift B. Arithmetic shift

C. Right rotate D. Left rotate

1. Which one is not combinational circuit?

A. Multiplexers B. Decoders

C. ROM D. Registers

1. For relative addressing, the implicitly referenced register is \_\_\_\_\_

A. The program counter (PC)

B. The memory address register (MAR)

C. The memory buffer register (MBR)

D. The instruction register (IR)