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1. Define computer architecture.

Computer architecture is composed of the rules and methods which describe how computer systems are organized, implemented and function.

2. What are the three (3) main subcategories of computer architecture?

Instruction set architecture, Microarchitecture, and Systems design.

3. Define Instruction Set Architecture (ISA), emphasizing those aspects of an ISA most relevant to programmers.

Instruction set architecture interprets the machine code that a processor reads and computes. The ISA also sets the word size, memory address modes, processor registers, and data type.

4. Briefly describe CISC and RISC as examples of instruction set architectures (ISAs).

A complex instruction set computer (CISC) has relatively more architectural complexity and many specialized instructions of which some are rarely used.

A reduced instruction set computer (RISC) simplifies the processor by efficiently implementing only the most frequent instructions, while less common operations are implemented as slower subroutines.

5. List the four (4) types of instructions that are common to many instruction set architectures (ISAs).

Data handling and memory operations: Set a register to a fixed constant value, read and write data from hardware devices.
Arithmetic and logic operations: Add, subtract, multiply, or divide the values of two registers, placing the result in a register. Bitwise operations, compare values, floating point instructions.
Control flow operations: Conditionally branch to another location, Call another block of code
Coprocessor instructions: Load/store data to and from a coprocessor or exchanging with CPU registers, Perform coprocessor operations.

6. Define microarchitecture in the context of computer engineering.

Microarchitecture is how a given instruction set architecture is implemented in a particular processor, implementations may vary due to different goals of a given design.

7. Define central processing unit (CPU).

The central processing unit is the electronic circuitry within a computer for executing the instructions of a computer program. It performs basic arithmetic, logic, controlling, and input/output operations specified by the instructions.

8. Briefly describe each of the steps in the fetch-decode-execute cycle.

Fetch involves retrieving an instruction from program memory. The instruction's address in memory is determined by a program counter which stores the next instruction address to be fetched. After an instruction is fetched, the PC is incremented by the length of the instruction to move to the next instruction.

Decode is performed by the circuitry known as the instruction decoder, the instruction is converted into signals that control other parts of the CPU, how its interpreted is defined by the instruction set architecture. Usually within the instruction there will be an opcode, indicates which operation is to be performed, while the remaining fields usually provide supplemental information, such as the operands. Those operands may be specified as a constant value (called an immediate value), or as the location of a value that may be a processor register or a memory address, as determined by some addressing mode.

Execute step is then performed. During each action, various parts of the CPU are electrically connected so they can perform all or part of the desired operation and then the action is completed, typically in response to a clock pulse. Very often the results are written to an internal CPU register for quick access by subsequent instructions. In other cases results may be written to slower, but less expensive and higher capacity main memory.

9. Define System on Chip (SoC).

System on Chip is a low power, integrated circuit with all components of a computer. These components usually include a central processing unit, memory, input/output ports and secondary storage. Depending on its purpose, an SoC may contain digital, analog, mixed-signal, and often radio frequency signal processing functions.

10. For what types of applications are SoCs typically used?

SoCs are common in smartphone mobile computing and edge computing.