**Review questions chapter 3**

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| **1.** **What general categories of functions are specified by computer instructions?**  Processor-memory: Data may be transferred from processor to memory or from memory to processor. Processor-I/O: Data may be transferred to or from a peripheral device by transferring between the processor and an I/O module. Data processing: The processor may perform some arithmetic or logic operation on data. Control: An instruction may specify that the sequence of execution be altered.  **2.** **List and briefly define the possible states that define an instruction execution**.   * **Instruction address calculation** (iac): Determine the address of the next instruction to be executed. Usually, this involves adding a fixed number to the address of the previous instruction. * **Instruction fetch** (if): Read instruction from its memory location into the processor. * **Instruction operation decoding**: Analyze instruction to determine type of operation to be performed and operand(s) to be used. * **Operand address calculation** (oac): If the operation involves reference to an operand in memory or available via I/O, then determine the address of the operand. * **Operand fetch** (of): Fetch the operand from memory or read it in from I/O. * **Data operation**: Perform the operation indicated in the instruction. * **Operand store** (os): Write the result into memory or out to I/O.   **3. List and briefly define two approaches to dealing with multiple interrupts**.  The first is to disable interrupts while an interrupt is being processed. A disabled interrupt simply means that the processor can and will ignore that interrupt request signal.  A second approach is to define priorities for interrupts and to allow an interrupt of higher priority to cause a lower-priority interrupt handler to be itself interrupted .  **4. What types of transfers must a computer's interconnection structure (e.g. bus) support?**  **Memory to processor:** The processor reads an instruction or a unit of data from memory.  **Processor to memory:** The processor writes a unit of data to memory.  **I/O to processor:** The processor reads data from an I/O device via an I/O module.  **Processor to I/O:** The processor sends data to the I/O device.  **I/O to or from memory:** For these two cases, an I/O module is allowed to exchange data directly with memory, without going through the processor, using direct memory access (DMA).  **5. What is the benefit of using a multiple-bus architecture compared to a single-bus architecture?**  In short, the number and type of buses used strongly affect the machine's overall speed. Simple computer designs move data with a single bus structure; multiple buses, however, vastly improve performance. |