END OF CH 9 EXERCISES

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9.5 Suppose you wish to send a block of data to a tape drive for storage using DMA. What information must be sent to the tape controller before the DMA transfer can take place?

The procedure used by the CPU to initiate a DMA transfer is straightforward. Four pieces of data must be provided to the I/O controller for the tape controller to initiate the transfer. The four pieces of data that the I/O controller must have to control a DMA transfer are as follows:

1. The location of the data on the Tape controller (the location of the block on the tape).
2. The starting location of the block of data in memory.
3. The size of the block to be transferred.
4. The direction of transfer, read (Tape $\rightarrow$ memory) or write (memory $\rightarrow$ Tape).

9.12 In general, what purpose does an interrupt serve? Stated another way, suppose there were no interrupts provided in a computer. What capabilities would be lost?

Interrupts are the primary means for the user to interact with the computer, as well as the means used for communication between the CPU and the various I/O devices connected to the system. There are many circumstances under which it is important to interrupt the normal flow of a program in the computer to react to special events.

Interrupt capabilities are used to make it possible to time-share the CPU between several different programs or program segments at once.

The interrupt handles all actions that require immediate attention from the computer such as - an attempt to execute an illegal instruction, a request for service from a network controller, or the completion of an I/O task initiated by the program. All of these suggest that it is necessary to include some means to allow the computer to take special actions when required. Without the use of interrupts this capability would be lost.

Chapter 9 Calculation Exercise If my CPU runs at 4.0GHz, and on average takes 10 clock cycles to complete an instruction, how many instructions will be completed in the time it takes to type "MY CPU IS RUNNING NOW"? Assume it takes 5 seconds to type the message. Show your work and how you arrived at the solution".

At 4.0 GHz the clock ticks $4 * 10^9$ times per second (Giga $= 10^9$)

instructions/second $= (4 * 10^9$ cycles/sec$) / (10$ cycles/instruction$) = 4 * 10^8$ instructions/sec

instructions completed $= (4 * 10^8$ instructions/sec$) * (5$ sec$) = 20 * 10^8$ instructions

$2 * 10^9$ instructions are completed

Reference: Englander, I. (2014). Chapter 9 Input/Output. In The architecture of computer hardware and system software an information technology approach. essay, John Wiley & Sons.