Score:_____   Name:_____

ECE 3055 Quiz 8 - March 16, 2005

1.(*4 pts.*) Compare the typical time to read or write a Windows cluster (i.e. a cluster is just a small group of disk sectors that the OS uses to allocate disk space in the file system tables). Assume each cluster has four 1024-byte sectors. Compare the new high performance Western Digital Serial ATA Raptor disk to a standard EIDE disk with these features:

Raptor: Average seek time is 4.5ms (use the book's suggested 1/3 correction factor for a more realistic or typical seek time) a serial ATA transfer rate of 150 Mbytes/sec, the disk rotates at 10,000 RPM, and the controller overhead is .075ms. On both disks, ignore the effects of the cache inside the disk and assume you can read all four contiguous sectors during a single pass over the disk cluster.

$$4.5/3 \text{ ms} + \frac{0.5}{10,000 RPM/60} + \frac{4096}{150 \times 10^6} + .075ms$$

Raptor Typical R/W Time __4.602__ ms.

Standard EIDE: Average seek time is 9.1ms (use the book's suggested 1/3 correction factor for a more realistic or typical seek time) an Ultra IDE transfer rate of 66 Mbytes/sec, the disk rotates at 7,200 RPM, and the controller overhead is .09ms.

$$9.1/3 \text{ ms} + \frac{0.5}{7200 RPM/60} + \frac{4096}{66 \times 10^6} + .09ms$$

EIDE Typical R/W Time __7.352__ ms. and the EIDE drive is __1.59__ times slower.

2. (*3 pts.*) A PC's PCI bus requires at least 5 clocks to transfer four 32-bit data values. Note: The first clock cycle is needed to send the address and the other four clocks transfer data at consecutive addresses. If the PCI bus clock is 66 MHz, what is the maximum I/O bandwidth?

$$4 bytes \times 66 \times 10^6 \times \frac{4}{5} = 211$$

PCI maximum I/O bandwidth is __211__ megabytes per second.

3. (*3 pts.*) List and briefly describe the three main methods used for I/O transfers in a computer. Rank the additional hardware needed and CPU overhead required for each. 1 is lowest or least.

I/O Transfer Technique	Hardware Needed	CPU overhead
Polling (Programmed) I/O Software checks ready bits in loops	1	3
Interrupt Driven I/O Ready bit generates interrupt	2	2
DMA Direct Memory Access controller transfers data	3	1