Assignment 03

Due on 09/29/2003

1. (**2.3**) A computer has a cache, main memory, and a disk used for *virtual memory*. If a referenced word is in the cache, 20 *ns* are required to access it. If it is in main memory but not in the cache, 60 *ns* are needed to load it into the cache, and then the reference is started again. If the word is not in main memory, 12 ms are required to fetch the word from disk, followed by 60 *ns* to copy it to the cache, and then the reference is started again. The cache hit ratio is 0.9 and the main memory hit ratio is 0.6. What is the average time in *ns* required to access a referenced word on this system?

   NOTE: *Virtual memory* informally refers to the technology in which some space in hard disk is used as an extension of main memory so that a user program need not worry if its size extends the size of the main memory. If that does happen, at any time only a part of the program will reside in main memory, and other parts will otherwise remain on hard disk and may be switched into memory later if needed. Please refer to Page 72 of the textbook if you need more information about it.

2. The frequency of the microprocessor is often used to compare the performances of different personal computers. For example, a Pentium 133MHz PC is supposed to be faster than a Pentium 75MHz one. This method however does not always hold, especially among different series of computers. Instead, a method called *benchmark* is usually used. Please do some research on it and organize an up-to-half-page introduction to this method. References you used should be given following your answer.

Good luck!