Adam Gincel

CS 383 B

Theoretical Assignment 2

1. MAR stands for Memory Address Register, which contains an address which points to real data. MDR stands for Memory Data Register, and is the register which stores the actual data, and whose address is pointed to by an MAR.
2. Parallel Buses contain multiple data wires and send multiple bits simultaneously. Serial Buses, on the other hand, send data sequentially, one bit at a time. Surprisingly, Serial Buses have higher transfer speeds, as Parallel Buses are prone to interference.
3. Subroutines have call and return functions. Call functions send arguments to the subroutine and transfer control to it. Return functions transfer control back to the caller and return the processed information.
4. Pipelining allows CPUs to execute instructions while reading in new ones. This parallel process is faster than executing and then reading sequentially.
5. Cache memory is significantly faster than main memory, even if it is much smaller. Locality of reference is very important; it is how the OS decides what memory to cache. Essentially, an OS will guess what the user is likely to ask for in the near future, and then cache it. Examples of this are recently used documents, and other portions of large files that have not been reached yet.
6. The clock cycle of a CPU is a measurement of how fast it can execute instructions. A CPU with a clock speed of 4.77 Mhz would be able to execute 4,770,000 times the number of instructions executable per cycle instructions per second.
7. A thread is a set of values which get sent to a processor. Multiprocessor systems are set up with either a Master-Slave system or a Symmetrical Multiprocessing system. In Master-Slave a master manages the entire system, and assigns processes to slaves. This process is simple, but if the master fails, the entire system fails. On the other hand, Symmetrical Multiprocessing allows each processor to determine what to run, and gives each of them full access to all resources. This is much more complex, and can even yield resource conflicts, but this system is more robust and less prone to failure.
8. DMA stands for Direct Memory Access; it allows attached devices to access a computer’s main memory without going through the CPU. This is much faster than other I/O methods. DMA communication is started when programmed I/O sends the location of wanted data on the I/O device, the starting location in main memory, the size of the desired block, and if the given request is read or write.
9. In an interrupt, a thread’s given “context”, or state of operation, is stored. From there the interrupt makes a new process begin as if it was the only process running. When the interrupt ends, the original context is restored, and the original interrupted process resumes as if nothing happened.
10. Polling Interrupt Processing involves polling each device in a given system once an interrupt signal is received to find which device sent the interrupt. To avoid polling everything, the address of the interrupting device can be sent along with the signal, but this requires more hardware.
11. A character based device transfers data byte by byte; terminals are good examples of this. Block based devices transfer data block by block, which can be entire sections of bytes. Hard drives are block based devices.
12. Flash memory is faster and more durable, compared to hard disks. On the other hand, you can get much more storage per dollar with hard disks. Both are nonvolatile, meaning they retain their storage even if they lose power. RAM is volatile, meaning it loses data upon power loss, and while it is significantly faster than both flash storage and hard disk storage, it is significantly more expensive than both.
13. A disk array is a group of multiple disks. There are multiple ways to configure these arrays; sometimes each disk holds identical information, stored in case of disk failure, and other times data can be “striped” along each disk, which increases performance.
    1. 512 \* 60 = 30720 bytes per track, 30720 \* 4000 = 112,880,000 bytes per surface, and the disk has a capacity of 112,880,000 \* 10 = 1,128,800,000 bytes
    2. 4000 \* 10 = 40000 Cylinders
    3. (1/7200) \* 60 = 4.267 seconds.
    4. (7200/60) \* 30720 bytes per second.