**After Midterm Assignment 2**

1. Consider a computer with a **32-bit** virtual address (logical address) and a **4K-bit** page size. How many entries are required in a **page table**? If each page table entry requires **4 bytes**, what is the **total size** of the page table?
2. Assume that an *average page-fault service time* of **8 ms** and a *memory access time* of **200 ns**. If one out of 1,000 memory accesses cause a *page fault*, then calculate its ***effective-memory access time*** (**EAT**).
3. Which one from the following code sequences (**Code1** and **Code2**) will cause more page fault? Give your explanation.

**Code1**:

for (j = 0; j < 128; j++)  
 for (i = 0; i < 128; i++)  
 data[i][j] = 0;

**Code2**:

for (i = 0; i < 128; i++)  
 for (j = 0; j < 128; j++)  
 data[i][j] = 0;

1. What is an I/O subsystem of a kernel?
2. Describe the relationship(s) among an I/O device, a device controller and a device driver.
3. Describe in detail how the **I/O subsystem** of a kernel supports an I/O operation.
4. What are the advantages and disadvantages of supporting **memory-mapped I/O** to device control registers?
5. How can a CPU give commands and data to an I/O controller to accomplish a data transfer?
6. Describe the term I**/O Polling**. Why is I/O polling inefficient? Suggests a solution to overcome the inefficiency of the I/O polling operation.
7. What is an **I/O system call**? Describe blocking and non-blocking system I/O system calls.
8. Briefly describe the operation of a **DMA** (direct memory access) I/O controller. Why is DMA transfer better for disk memories?
9. Describe various circumstances under which **nonblocking I/O** should be used. Why not just implement nonblocking I/O and have processes busy-wait until their devices are ready?
10. Describe the term Virtual Machine (VM). What is the advantage of VM implementation on a computer system? Explain.
11. Describe the term hypervisor (or Virtual Machine Monitor).
12. Discuss the various types of hypervisors (also called Virtual Machine Managers, VMMs).
13. Describe the difference between full virtualization and paravirtualization.
14. Describe the live migration feature of a VMM.
15. What are the difficulties in implementing the concept of VM? Explain.
16. Describe the importance of virtual CPU (VCPU) in a virtualization system.
17. Describe the two techniques which are used by VMM to implement virtualization on a computer system.