



COMP 346 – Fall 2017
Theory Assignment 1
Due Date & Submission Format: The .

Answer all questions

Due Date	By 11:59pm Friday September 29, 2017
Format	Assignments must be typed and submitted online to Moodle system. Scanned Hand-written assignments will be discarded.
Late Submission:	none accepted
Purpose:	The purpose of this assignment is to help you learn the overview of computer operating system and Input and output mechanisms.
CEAB/CIPS Attributes:	Design/Problem analysis/Communication Skills

Question # 1

- I. What is an operating system? What are the main purposes of an operating system?
- II. Define the essential properties of the following:
 - Batch
 - Time sharing
 - Dedicated
 - Real time
 - Virtualization
 - DMA
 - Interrupt Timeline
 - Daisy chain
- III. Under which circumstances it is better using a time-sharing system rather than a PC or single-user workstation?

Question # 2

- I. What is the performance advantage in having devices synchronization by means of device interrupts, rather than by polling (i.e., device driver keeps on polling the device to see if a specific event has occurred)? Under which circumstances can polling be advantageous over interrupts?
- II. Is it possible to use a DMA controller if the system does not support interrupts? Explain why.

Question # 3

- I. If a user program needs to perform I/O, it needs to trap the OS via a system call that transfers control to the kernel. The kernel performs I/O on behalf of the user program. However, systems calls have added overheads, which can slow down the entire system. In that case, why not let user processes perform I/O directly, without going through the kernel?
- II. Consider a computer running in user mode. It will switch to kernel mode whenever an interrupt or trap occurs, jumping to the address determined from the interrupt vector.

- (a) A smart, but malicious, user took advantage of a certain serious loophole in the computer's protection mechanism, by which he could make run his own user program in the kernel mode! This can cause disastrous effects. What could have he possibly done to achieve this? What disastrous effects could it cause?
- (b) Suggest a remedy for the loophole.

Question # 4

Assume you are given the responsibility to design two OS systems, a Network Operating System and a Distributed Operating System. Indicate the primary differences between these two systems. Additionally, you need to indicate if there are any possible common routines between these systems? If yes, indicate some of these routines. If no, explain why common routines between these two particular systems do not make sense.

Question # 5

How can we make MS-DOS operating system a layered structure with minimal effort?

Question #6

Suppose that you have a costumed-designed board that has memory mapped I/O CPU. What is the procedure to add a new I/O hardware to this board and access it?