

King Saud University
Computer Science Department
CSC 227: Operating Systems - Summer 2014
Mid Term 1 Exam

Time: 10:30 – 12:30

***** Part 1 *****

Q1-1. What is the purpose of interrupts? What are the main types of interrupt?[2 marks]

Ans :

An interrupt is a hardware-generated change-of-flow within the system.

key pressed, power on/off, end of data transfer

Q1-2. What is the purpose of supervisor or kernel mode? [1 mark]

Ans: To protect the OS

Q1-3. List two functions of operating system with regard to memory management, [1 mark]

Ans:

- keeping track of which parts of memory are currently being used and by whom**
- deciding which process (or parts thereof) and data to move into and out of memory**
- allocating and deallocating memory space as needed**

Q1-4. List two functions of operating system with regard to process management. [1 mark]

Ans:

- creating and deleting both user and system processes**
- suspending and resuming processes**
- providing mechanisms for process synchronization**
- providing mechanisms for process communication**
- providing mechanisms for deadlock handling**

Q1-5. For what kind of devices direct memory access is used? [1 mark]

Ans: High-speed devices such as the disk drivers

Q1-6. What are the two common system structures for the operating system? [1 mark]

Ans: Layered, modular, (some might answer), microkernel

Q1-7. Under what circumstances a user is better off using time-sharing system rather than a personal computer or single-user workstations? [2 marks]

Ans: For large tasks with fast hardware available provided there are few users.

Q1-8. Which are privileged instructions?

[2 marks]

- a) Change to user mode
- b) Write into monitor memory
- c) Turn off timer interrupt
- d) Read the time of day
- e) Set the mode bit
- f) I/O instructions

***** Part 2 *****

Q2-1. What is an API? [1 mark]

Ans: Application Programming Interface: A programming interface to the services provided by the OS.

Q2-2. What are the most common APIs available? [1 mark]

Ans: Three most common APIs are Win32 API for Windows, POSIX API for POSIX-based systems (including virtually all versions of UNIX, Linux, and Mac OS X), and Java API for the Java virtual machine (JVM).

Win32 API for Windows.

POSIX API for POSIX-based systems (UNIX, Linux, MacOS X). Java API for the Java Virtual Machine (JVM).

Q2-3. What is the difference between program counter and instruction register? [1 mark]

Ans: Program counter holds the address of next instruction to be executed. Instruction register holds the address of instruction currently executing.

Q2-4. How does the distinction between monitor mode and user mode function as a rudimentary form of protection (security) system? [1 mark]

Ans:

The distinction between kernel mode and user mode provides a rudimentary form of protection in the following manner. Certain instructions could be executed only when the CPU is in kernel mode.

Similarly, hardware devices could be accessed only when the program is executing in kernel mode. Control over when interrupts could be enabled or disabled is also possible only when the CPU is in kernel mode. Consequently, the CPU has very limited capability when executing in user mode, thereby enforcing protection of critical resources.

Q2-5. For portability purpose, which one do you prefer to use: system calls or C standard library function calls? Why? [2 marks]

Ans: C standard library function calls are preferred when migrating from an OS to another.

Q2-6. Describe three general methods of passing parameters. [1 mark]

Through registers,

Passing address of the data block,

Through stack.

Q2-7. What is the main advantage of the microkernel approach to OS design? [1 mark]

Ans: Benefits typically include the following (a) adding a new service does not require modifying the kernel, (b) it is more secure as more operations are done in user mode than in kernel mode, and (c) a simpler kernel design and functionality typically results in a more reliable operating system.

- Easier to extend a microkernel.
- Easier to port the OS to new architectures.
- More reliable (moves as much from the kernel into user space).
- More secure.

Q2-8. Define following: [4 marks]

- a) Batch
- b) Interactive
- c) Time Sharing
- d) Real time

a) **Batch**

Jobs with similar needs are batched together and run through the computer as a group by an operator or automatic job sequencer. Performance is increased by attempting to keep CPU and I/O devices busy at all times through buffering, off-line operation, spooling, and multiprogramming. Batch is good for executing large jobs that need little interaction; it can be submitted and picked up later.

b) **Interactive**

This system is composed of many short transactions where the results of the next transaction may be unpredictable. Response time needs to be short (seconds) since the user submits and waits for the result.

c) **Time sharing**

Uses CPU scheduling and multiprogramming to provide economical interactive use of a system. The CPU switches rapidly from one user to another. Instead of having a job defined by spooled card images, each program reads its next control card from the terminal, and output is normally printed immediately to the screen.

d) **Real time**

Often used in a dedicated application. The system reads information from sensors and must respond within a fixed amount of time to ensure correct performance.

Q2-9. In a multiprogramming and time sharing environment, several users share the system simultaneously. This situation could result in various security problems. What are two such problems? [2 marks]

Stealing or copying one's program or data without proper accounting.
Difficulty in designing protection scheme because of its complexity.