**PART A**

Microsoft Windows :

The user interface of MS Windows is Graphics User Interface (GUI) with CLI shell, so it is a friendly desktop metaphor interface and the user usually uses mouse, keyboard to control computer. Icons represent files, programs, actions, and so on. Various mouse buttons over objects in the interface cause various actions. The most important subsystem is Win32. Win32 API represents the native environment for MS Windows product. MS Windows uses Microkernel System Structure. Moves as much from the kernel into user space. Communication takes place between user modules using message passing. The advantage of Microkernel are easier to extend, easier to port the operating system to new architectures, more reliable, and more secure.

Unix :

The structure of Unix is Layered Operating System. Consists of everything below the system (call interface and above the physical hardware.) Provides the file system, CPU scheduling, memory management, and other operating-system functions. A large number of functions for one level

Because the advantage of Unix are the advantage of Multi-User, Multi-Programing and Multi-Tasking, many severs’ OS are Unix.

**PART B:**

The Android operating system

is an open-source operating system based on the Linux kernel and is primarily loaded onto mobile devices with ARM architecture. Android’s user interface is built specifically for touch based devices and thus utilizes swiping, tapping, pinching to manipulate the space. In addition Android utilizes hardware commonly found in mobile devices such as the accelerometer, gyroscope, proximity sensors and vibration motors. Android allows for live widgets and application shortcuts on the home screen and allows for application generated notifications. Android allows for vibrational feedback as a response to user input called haptic feedback. Games on android devices are able to utilize the gyroscope to mimic for example the steering of a race car. Google Play is a native Android app that acts as a market and allows users to download other third-party apps. The application framework of Android allows for replacement and reuse of existing components. Android applications are written primarily in the Java programming language along with the Android SDK. Android comes loaded with many Google applications such as Gmail, Calendar, Maps, Web Search, Chrome, Google+ and many more.

iOS

derived from OS X that share by Darwin foundation. This iOS mainly use for apple product such as iPhone and iPad [8]. There are 4 abstraction layers which are Core OS layer, Core Services Layer, Media Layer and Cocoa touch layer. Core OS layer is the bottom layer of the iOS stack and sit directly on the hardware. This layer provides a range of services including low-level network access to external accessories and common operating system services such as memory management policy, and thread handling file system. The iOS Core Services layer provides the foundation on which many previous layers referenced constructed and consists of the following framework. Media layer contains the graphics, audio, video and technology geared towards creating the best multimedia experience available on a mobile device. Technology in this layer has been designed to make it easy for you to build applications that look and sound great. The Cocoa Touch layer provides the key framework for building iOS applications.

Comparison:

Application Sandboxing

Android: Each app has its own sandbox

iOS: All apps shared

Memory randomization

Android: Fully applied in Jelly Bean Release, No code signing technology

iOS: Already applied in 4.3 releases. Added with code signing technology

Encryption

Android: Disk encryption

iOS: Hardware

Data Storage Format

Android: Have an external storage and can be accessible by unwanted code

iOS: No external storage and difficult for unwanted code to access built in storage

Built in

Android: Antivirus can be downloaded from the Android market.

More easy for virus attack since no protection and checking is done before outside

before app is downloaded

iOS: No antivirus is required since there is checking been done in the Apps Store

**Part C:**

Real time system :

A real-time operating system (RTOS) is an operating system that guarantees a certain capability within a specified time constraint. There are two kinds RTOS, the first is hard and the other one is soft.

Hard: considers any missed deadline to be a system failure. This scheduling is used extensively in mission critical systems where failure to conform to timing constraints results in a loss of life or property.

Soft: allows for frequently missed deadlines, and as long as tasks are timely executed their results continue to have value. Completed tasks may have increasing value up to the deadline and decreasing value past it.

The most common designs are:

Event-driven – switches tasks only when an event of higher priority needs servicing; called preemptive priority, or priority scheduling.

Time-sharing – switches tasks on a regular clocked interrupt, and on events; called round robin.

In typical designs a task has three states:

* Running (executing on the CPU);
* Ready (ready to be executed);
* Blocked (waiting for an event, I/O for example).

For example : WinCE

Embedded system :

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. Embedded systems are designed to do some specific task, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability. For example : mobile phones, brakes on a car.

Embedded systems are not always standalone devices. Many embedded systems consist of small parts within a larger device that serves a more general purpose.

TSR processes :

TSR (terminate and stay resident) processes refer to programs within DOS that can remain in memory once they’ve been loaded in order to be easily reactivated by a simple interrupt as opposed to the process being removed from the memory and having to be retrieved again. This was used in the times of DOS to overcome the limitation of single task execution at a time. The advantage of this is these processes are generally fast to load but the disadvantage is that many TSR’s at a time greatly reduce the memory availability to other processes and programs. In addition some TSR’s might not interact well with each other if loaded simultaneously in the memory.

For example : calendar, clock,virus scanner

**PART D:**

An interrupt is a signal sent from either a hardware device or a program notifying the operating system that it needs to take care of something. Computers nowadays use interrupts all the time to ensure attention is given when needed. In this way a program that is currently running can be stopped in order for the operating system to be able to handle something else. This interrupt service is the key to multitasking nowadays. Although using interrupts isn’t exactly perfect multitasking, operating system engineers have designed them to act as though many things can happen at the exact same time but in reality there are many fast interrupts going on in the background. The process specifically starts with the current code or thread being suspended (temporarily saved) then an interrupt handler is executed to deal with the event. Once the event has been dealt with the processor resumes to execute the previous thread. There are two types of interrupts: A hardware interrupt could be a keyboard or mouse press while a software interrupt is an exception which could be caused for example in a case where divide by zero is done. All interrupts have a matching interrupt handler and all hardware interrupts initiations are called interrupt requests. Hardware interrupts are limited by the number of designated interrupt request lines to the processor while software interrupts don’t have a constraint. The interrupt request value is specific to each device thus before Plug and Play was introduced, interrupt request values had to be entered manually into the system in order for them to function properly. The reason why is because only one interrupt request can be handled at a time thus if there are identical values it could conflict. The interrupt requests are also assigned priorities in order to be as efficient as possible.

The “man” command is used to access the manuals for Linux commands. Executing the “man trap” command in the terminal returns the list of commands built into the Bash shell, including a detailed description of each command as well as the arguments that, if any, that they accept. For example, the operator “.”, which is used to execute a commands from a shell script in the current directory, is actually a command that is built into the bash shell.

**Part E**

No, JVM is not considered as Operating Systems. Because **JVM** is an abstract computing machine, or virtual machine. It is a platform-independent execution environment that converts Java bytecode into machine language and executes it. Most programming languages compile source code directly into machine code that is designed to run on a specific microprocessor architecture or operating system, such as Windows or UNIX.

**PART F:**

Carefully read the posted Grading Policy and the definitions for Plagiarism and Cheating posted on the course webpage under **Academic Integrity**

If you have any questions related to these topics please email me. Otherwise, please enter your name in the following paragraph. At the end of the paragraph sign your name by entering the initials.

*I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_En Lin\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ have carefully read and understood the posted Grading Policy, and the definitions of Cheating and Plagiarism given in the Academic Integrity link. I am aware that any student caught cheating or plagiarizing will automatically receive an F for the course and that other forms of dishonesty will result in similar actions.*

Initials: \_\_\_\_\_\_\_\_\_\_EL\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_