Name: _phuong Vo_

Exam #1: Part 1 of 2

COMP.3080-201-202 – Operating Systems; October 15, 2019 – Dr. Wilkes

Note: *This exam is closed book and notes, except for one 8.5x11" sheet of paper with handwritten notes, front and back (no photocopies).*

Multiple Choice Questions – 5 points each: Mark the correct answer(s).

1. **(MARK A SINGLE ANSWER)** Which of the following operating system designs allows direct intercommunication between every component, making the system highly efficient?
   - O Distributed OS design
   - ● Hybrid OS design
   - O Layered OS design
   - O Microkernel OS design
   - O Monolithic OS design
   - O None of the above

2. **(MARK A SINGLE ANSWER)** When an I/O interrupt arrives for a process, the operating system places the process into the _____ state.
   - O New
   - O Ready
   - O Running
   - O Terminated
   - ● Waiting
   - O None of the above

3. **(MARK A SINGLE ANSWER)** Function parameters and local variables are stored in the _____ of a process's memory.
   - O Code (text) section
   - O Data (global) section
   - O Heap section
   - ● Stack section
   - O None of the above

4. **(MARK ALL THAT APPLY)** Which of the following are true for a peer-to-peer (P2P) network?
   - ☐ Does not distinguish between client nodes and server nodes
   - ☐ A given node may act as a client, a server, or both
   - ☑ Each node must join the P2P network either via registering with a central lookup service, or via a distributed discovery protocol
   - ☐ None of the above

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5. **(MARK A SINGLE ANSWER)** A message passing system that does not require the sender to know the identity of the receiver, or vice versa, is known as a(n) _____ .
   - O Asynchronous message
   - O Blocked communication
   - ◉ Direct message
   - O Mailbox
   - O Rendezvous
   - O None of the above

6. [Mark the <u>single</u> "fill-in-the-blanks" answer below that is the best fit for the following statement:]
   In a microkernel architecture, the kernel typically includes only a small number of services, such as **(A)**_____; most other services, such as **(B)**_____, execute outside of the microkernel with a lower privilege level.
   - O (A) message passing; (B) file system management
   - O (A) device management; (B) networking
   - O (A) networking; (B) process management
   - ◉ (A) interprocess communication; (B) low-level memory management
   - O None of the above

7. **(MARK A SINGLE ANSWER)** Suppose that a host with IP address 140.33.44.55 wishes to download a file from the web server at IP address 236.19.20.117 (using the standard HTTP port). Select a valid socket pair for a connection between this pair of hosts.
   - O 140.33.44.55:80 and 236.19.20.117:80
   - O 140.33.44.55:80 and 236.19.20.117:3400
   - O 140.33.44.55:148 and 236.19.20.117:80
   - ● 140.33.44.55:3192 and 236.19.20.117:80
   - O None of the above

8. **(MARK A SINGLE ANSWER)** A cloud service in which the cloud vendor provides a customer with a software stack (e.g., database server) ready for application use via the Internet is called:
   - ◉ Infrastructure as a Service (IaaS)
   - O Platform as a Service (PaaS)
   - O Software as a Service (SaaS)
   - O None of the above

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1. The operating system kernel consists of all system and application programs in a computer.
   - ○ True
   - ● **False**

2. System calls can be run in either user mode or kernel mode.
   - ○ True
   - ● **False**

3. The difference between a program and a process is that a program is an active entity while a process is a passive entity.
   - ● True
   - ○ **False**

4. In UNIX systems, the `exec()` system call creates a new process.
   - ○ True
   - ● **False**

5. Ordinary pipes in UNIX require a parent-child relationship between the communicating processes.
   - ○ **True**
   - ● False

6. Non-blocking `send` or `receive` operations are considered synchronous.
   - ● True
   - ○ **False**

7. Interrupts may be triggered by either hardware or software.
   - ○ **True**
   - ● False

8. In the "Windows NT" architecture, the Win32 Environment Subsystem and the Windows Subsystem for Linux coexist as user mode services, running above a kernel mode layer comprising the Executive Services and a microkernel.
   - ○ **True**
   - ● False

9. Mac OS is a hybrid system incorporating aspects of monolithic/modular, layered, and microkernel designs.
   - ● True
   - ○ False

10. Real-time operating systems must guarantee that well-defined fixed time constraints are always met.
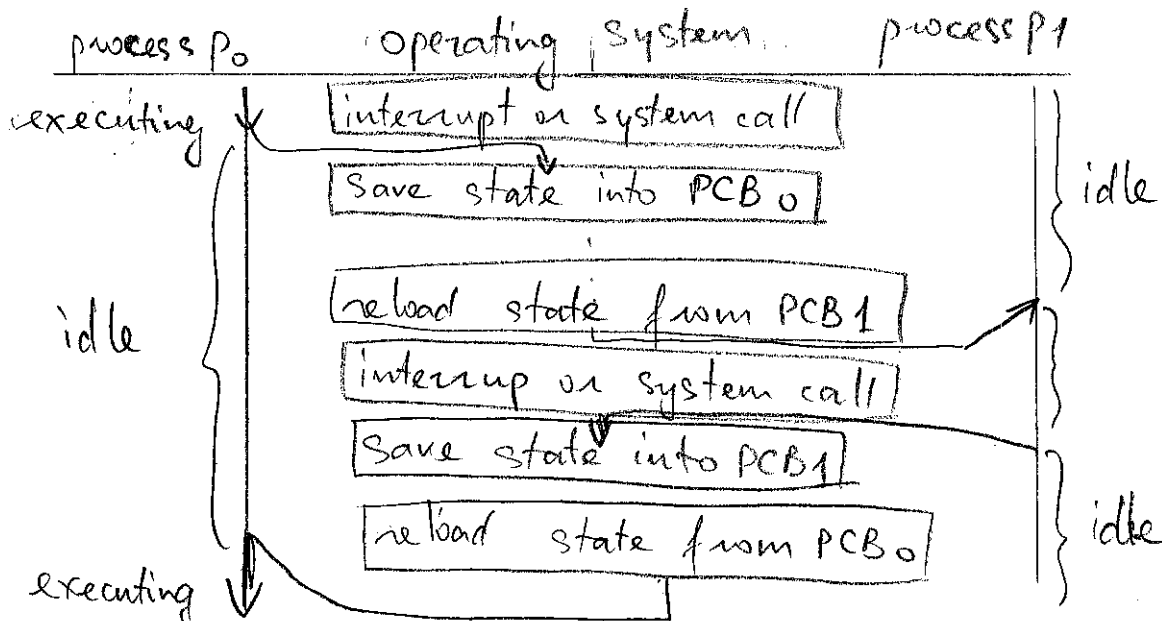   - ● True
    - ○ False

Exam #1: Part 2 of 2

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Short Answer Questions – 10 points each: Write your answer in the space provided.

1. Describe the steps performed by the operating system during a process context switch.

process P_0 Operating System   process P_1

executing

interrupt or system call

Save state into PCB$_0$ }idle

idle

reload state from PCB$_1$

interrup or System call

Save state into PCB$_1$ }idle

reload state from PCB$_0$

executing

2. Explain why Google Chrome uses multiple processes.

Because google chrome uses an application kernel that allows Chrome to load / reload the content of all active browsing tabs at a time. That kernel is named chrome kernel, developed by google.

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3. In UNIX programming, ordinarily the exec() system call follows the fork() call. Explain what would happen if a programmer were to inadvertently place the call to exec() before the call to fork().

, In the child process, the fork() returns 0, whereas in the parent process, the fork() call returns the PID of the child process.

o The programmer wants to make a calling process to run a different program. Then the exec() would return the value after the process has done.

4. Explain why the operating system must translate function parameter and return values to and from a standard intermediate form in order to perform a Remote Procedure Call.

Because Remote Procedure Call is the calling process allows inter-communicating between the kernel of the Operating System and the application programs.