Name: ANSWER

Exam #1: Part 1 of 2 – Sample Questions

COMP.3080 – Operating Systems – 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 single answer.

1. Which of the following operating system designs is the most popular design today, due to its combination of relatively high flexibility and performance?
   - ○ Distributed OS design
   - ○ Layered OS design
   - ○ Microkernel OS design
   - ○ Modular OS design
   - ○ Monolithic OS design
   - ○ None of the above

2. Suppose that a host with IP address 150.23.56.42 wishes to display an image from the web server at IP address 244.01.02.123 (using the standard HTTP port). Select a valid socket pair for a connection between this pair of hosts.
   - ○ 150.23.56.42:80 and 244.01.02.123:80
   - ○ 150.23.56.42:80 and 244.01.02.123:3400
   - ○ 150.23.56.42:2701 and 244.01.02.123:80
   - ○ 150.23.56.42: 2701 and 244.01.02.123:3400

3. A race condition ____.
   - ○ will result only if the outcome of execution does not depend on the order in which instructions are executed
   - ○ results when several threads try to access the same data concurrently
   - ○ results when several threads try to access and modify the same data concurrently
   - ○ none of the above

4. According to Amdahl's Law, what is the speedup gain for an application that is 80% parallel and we run it on a machine with 10 processing cores?
   - ○ 1.33
   - ○ 2.40
   - ○ 3.08
   - ○ 3.57
   - ○ 4.33

https://www.chegg.com/homework-help/questions-and-answers/7-according-amdahl-s-law-speedup-gain-application-60-parallel-run-machine-4-processing-cor-q37522754

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5. A blocking `send()` and non-blocking `receive()` is known as a(n) _____ .
   - ○ asynchronous message
   - ○ blocked communication
   - ○ rendezvous
   - ○ synchronized message
   - ○ none of the above

6. **[Mark the "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.
   - ○ (A) device management; (B) networking
   - ○ (A) file system management; (B) low-level memory management
   - ○ (A) low-level memory management; (B) file system management
   - ○ (A) networking; (B) process management

7. A cloud service in which the cloud vendor provides a customer with a complete virtual server image ready for use via the Internet is called:
   - ○ Infrastructure as a Service (IaaS)
   - ○ Platform as a Service (PaaS)
   - ○ Software as a Service (SaaS)
   - ○ None of the above

8. A(n) _____ refers to code in which a process is **requesting** access to shared data.
   - ○ critical section
   - ○ entry section
   - ○ mutex
   - ○ test-and-set
   - ○ none of the above

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True/False Questions – 2 points each: Mark the correct single answer.

1. The operating system kernel consists of the portion of the operating system that is always running.
   - ○ True
   - ○ False

2. The difference between a program and a process is that a process is an active entity, whereas a program is a passive entity.
   - ○ True
   - ○ False

   https://techdifferences.com/difference-between-program-and-process.html

3. System calls can be run only in kernel mode.
   - ○ True
   - ○ False

4. Interrupts can be triggered only by hardware.
   - ○ True
   - ○ False

5. In UNIX systems, the `exec()` system call causes the calling process to run a different program.
   - ○ True
   - ○ False

6. Named pipes in UNIX require a parent-child relationship between the communicating processes.
   - ○ True
   - ○ False

7. Concurrency means that multiple tasks can execute simultaneously if multiple cores or processors are available, whereas parallelism means that multiple tasks can achieve progress via serial execution on a single core or processor.
   - ○ True
   - ○ False

8. It is possible to create a thread library without any user-level support.
   - ○ True
   - ○ False

9. Each thread has its own register set and virtual memory space.
   - ○ True
   - ○ False

10. Practical solutions to the critical section problem require hardware support.
    - ○ True
    - ○ False

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Exam #1: Part 2 of 2 – Sample Questions

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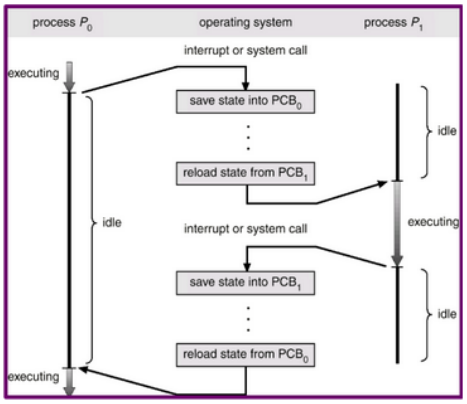
Short Answer Questions – 10 points each: Write your answer in the space provided.

1. Briefly describe what is involved in a process context switch.

   https://www.coursehero.com/file/6733851/Midterm-Fall-2001/?justUnlocked=1#/doc/qa

   https://stackoverflow.com/questions/17228441/context-switch-questions-what-part-of-the-os-is-involved-in-managing-the-contex

   => Save registers in process-table entry Jump to timer interrupt-handler Change the state of the process from running to ready Choose the next process to run from the ready processes. Set this process in running state. Restore the registers of the next process in the CPU Return from interrupt.



2. In UNIX programming, the `fork()` system call creates a child process that is a clone of the parent process. What is the one difference between the parent process and the child process when the `fork` is complete?

   https://www.tutorialspoint.com/process-vs-parent-process-vs-child-process

   http://www2.cs.uregina.ca/~hamilton/courses/330/notes/unix/fork/fork.html

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3. OpenMP (for C/C++/FORTRAN) and Grand Central Dispatch (for C/C++/Objective-C/Swift) are technologies with similar goals: To allow people who are not experts in parallel programming techniques to “parallelize” existing programs. Briefly describe how these technologies work, including a short example of each technique.

4. Briefly describe the concept of thread-local storage, and how it can be useful.

https://docs.microsoft.com/en-us/windows/win32/procthread/thread-local-storage

provide unique data for each thread that the process can access using a global index. One thread allocates the index, which can be used by the other threads to retrieve the unique data associated with the index.