

KING SAUD UNIVERSITY
COLLEGE OF COMPUTER AND INFORMATION SCIENCES
COMPUTER SCIENCE DEPARTMENT

CSC 227: Operating Systems

Final Exam Fall 2008/2009

Date: Feb. 2, 2009

Time: 1:00 – 3:30 pm

Student Name:

ID#:

Section#:

This examination is close notes and close book.

QUESTION 1 [10 marks]

1. [1 mark] Define an OS from your point of view.

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2. [1 mark] An OS performs allocation of resources. Mention two of these resources.

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3. [2 marks] Give example of each of the following:

Exception	An i/o interrupt	A system call	Privileged instruction

4. [1 mark] A process is executing and it enters an infinite loop. What is going to happen to other processes in a

Multiprogramming system	Time-sharing system

5. [1 mark] Rank the following types of memory according to their sizes; writing the smallest first: RAM, Magnetic disk, CPU registers, tape drives, cache

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6. [2 marks] Write down two cache information you will look for when you intend to buy a new laptop.

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Cache use may also create a problem. Write down such problem

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7. [1 mark] One set of OS services provides functions that are helpful to the user. Mention two of such services.

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8. [1 mark] What tasks are performed by the bootstrap program?

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QUESTION 2 [10 marks]

1. [1 mark] Give two reasons why a process may terminate without completing execution.

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2. [0.5 mark] What is the main difference between user-level and kernel-level threads?

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3. [2 marks] What is context switch?

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Is this executed in the user mode or kernel mode?

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What would happen if the context switch time were too long?

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4. [1 mark] Assume that the OS implements Many-to-Many multithreading model. What is the minimum number of kernel threads required to achieve better? Why?

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5. [2 marks] What is the purpose of a system call?

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Mention two methods used to pass parameters to the OS.

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6. [2 mars] How many times does each of the programs below prints “Hello”?

<pre>int main () { fork(); fork(); fork(); print "Hello" }</pre>		<pre>int main () { fork(); print "Hello" fork(); print "Hello" fork(); print "Hello" }</pre>	
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7. [0.5 mark] When a process is not responding in a Windows environment, in which queue is the process placed?

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8. [0.5 mark] How is a system call different from a procedure call?

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9. [0.5 mark] What is the purpose of the interrupt vector?

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QUESTION 3 [6 marks]

1. [2 marks] What advantage is there in having different time-quantum sizes on different levels of a multilevel queuing system?

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2. [2 marks] What is the difference between multilevel queue scheduling and multilevel feedback queue scheduling?

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3. [2 marks] What are the advantages and disadvantages in choosing a small length of the time-slice in round robin scheduling?

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QUESTION 4 [8 marks]

1. [2 marks] Show that if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated.

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2. [4 marks] Suppose two processes with IDs 0 and 1 need to share some critical region of code, which only one at a time is allowed to execute, and where they are required to repeatedly cycle through this section in the natural order (0, 1). If turn is a shared integer variable initialized to zero, and currentPid is the ID of the currently executing process, and each executes the following pseudo-code, could a race condition occur? Why or why not? Be precise.

```
While (TRUE)
{
    while( turn != currentPid ) /* wait */ ;
    critical region();
    turn = (turn + 1) % 2;
    noncritical region();
}
```

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3. [2 marks] Consider two processes Pa and Pb using two semaphores S and Q initialized to 1. S and Q are implemented with waiting queues.

Pa wait (S); wait (Q); ... signal (S); signal (Q);	Pb wait (Q); wait (S); ... signal (Q); signal (S);
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What situation may occur when Pa and Pb are running?

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QUESTION 5 [6 marks]

1. [4.5 marks] Consider a swapping system in which memory consists of the following hole sizes in memory order: 10 KB, 4 KB, 20 KB, 18 KB, 7 KB, 9KB, 12 KB, and 15 KB. Which hole is taken for successive segment requests of

- (a) 12 KB
- (b) 10 KB
- (c) 9 KB

for First Fit.

Repeat the question for Best Fit and Worst Fit.

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2. [1.5 marks] A swapping system eliminates holes by compaction. Assuming a random distribution of many holes and many data segments and a time to read or write a 32-bit memory word of 10 nsec, about how long does it take to compact 128 MB?

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