

This exam is **closed book**. You can have **one sheet** (that is, **two pages**) of notes.
Please answer every part of every question

1. Give one example of a *covert channel* that a rogue service could use to leak information. (5 points)
2. Explain why Nooks is (a) more *extensible* than UNIX, (b) more *efficient* than Mach and (c) *easier to implement* than Spin? (3×5 points)
3. Would it be a good idea to let Kerberos use the same key K_{tgs} for all its tickets? (4 points) Why? (6 points)
4. One of the five basic principles of the exokernel xOK is “Using physical names whenever possible.”
 - a) What is the main advantage of this approach? (10 points)
 - b) Is this approach generally followed by other operating systems? (5 points) Why? (5 points)
5. Consider a single-ring Totem system comprising two processors A and B. Assuming that each of these two processors has received the following messages:

Processor	Messages
A	3, 4, 5, 6, 7
B	3, 5, 7

Which messages will be delivered by each processor:

- a) If all messages are *agreed delivery messages*? (10 points)

A will deliver messages _____

B will deliver messages _____

- b) If message 4 is a *safe delivery messages*? (10 points)

A will deliver messages _____

B will deliver messages _____

6. What is wrong with the following CSP implementation of *binary semaphores*? (10 points)

val : integer; val := 0;

*[(i:1..100) val = 0; X(i)?V() → val := 1; || (i:1..100) val = 1; X(i)?P() → val := 0]

(Hint: the problem is in the way the code interacts with the 100 processes that are allowed to access it.)

7. Assuming that you are living ten minutes away from school and that you carry data between the two locations, what is the maximum acceptable drift between the clocks of your home computer and the school computer? (5 points) Justify your answer. (10 points)
8. According to the authors of Nooks, what is the major factor in the cost of switching between the kernel protection domain and an extension protection domain? (5 points)