

**NAME** \_\_\_\_\_

**MIDTERM EXAM • CS 3210 Design of Operating Systems  
College of Computing, Georgia Tech • Hutto • Spring 2002**

*This exam is closed book. You have 90 minutes. There are 8 questions worth 12.5 points each for a total of 100 points. Spend about 10 minutes on each question. Partial credit is possible. All questions have relatively short answers. Write legibly! If you have questions, raise your hand. Good luck!*

**Exam 1 – topics**

- **Booting / Kernel Init (1)**
- **Intro to Linux (1)**
- **Kernel Modules, /proc Filesystem (1)**
- **System Calls (1)**
- **Memory Addressing (1)**
- **Processes (1)**
- **Interrupts / Exceptions (1)**
- **Timers / Timing (1)**

## Booting / Kernel Init

1. What is the **relationship** between the **init kernel thread** and **/sbin/init**? Describe the **role** of /sbin/init in Linux.

## Intro to Linux / iPAQ

2. Describe the mechanism that Linux uses to **isolate architecture dependencies** and to **simplify porting**.

## Kernel Modules

3. The `insmod` program is a user-level application that loads or “inserts” a specified **kernel module**. How do you think `insmod` is actually **implemented**? In particular, does it require any special **capabilities** to do its job? Explain.

## System Calls

4. What is the difference between so called “**fast**” and “**slow**” **system calls**? Give an example of each.

## Memory Addressing

5. The **Intel architecture** supports **physical**, **logical** and **linear addresses**. Explain.

## Processes

6. What is the difference between **user** and **kernel stacks**? What is the **relationship** between a **kernel stack** and **task\_struct** in Linux?

## Interrupts / Exceptions

7. Describe the role of the **PIC** in the Linux **interrupt architecture**.

## Timers and Timing

8. Describe how Linux uses the **PIT**, **TSC** and **RTC** to keep track of time.