CS 376	**Operating Systems**	Test 1
Name:	Fall 2001	Max Pts: 52

Important: This is an open book test. You can use any books, notes, or paper. You are not allowed to use any electronic/communication devices. *Do not log into the computer during the test.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [8 pt] What is the difference between a context switch and a process being dispatched? Do we require a context switch for the process to be dispatched? Do we require a process to be dispatched for context switch?

2. [8 pt] What is the difference between programmed I/O and interrupt-driven I/O? Under what circumstances will you use either of the two (if these two are the only choices)?

3. [6 pt] What type of kernel is used in Linux? Why was it chosen to be so?

4. [8 pt] Why do we need two modes of execution (kernel and user) in an operating system, even though some of the kernel functions run in user mode?

5. [10 pt] Does the following code satisfy critical section problem for two processes? Explain your answer.

```
extern bool flag[2] = {false, false};   // Shared with initialization as shown

process p ( const int i )               // i is 0 or 1 to identify process
{
    while ( 1 )
    {
        flag[i] = true;
        while ( flag[1-i] )
        {
            flag[i] = false;
            sleep ( rand() );          // Sleep for a random amount of time
            flag[i] = true;
        }

        critical_section ( i );

        flag[i] = false;

        remainder_section ( i );
    }
}
```

6. [8 pt] Consider the following solution to producer/consumer problem. Explain why this solution will work or will not work.

```
extern buffer_type buffer ( empty );      // Can be empty or full
extern bin_semaphore s ( true );
extern bin_semaphore delay ( false );

void producer()
{
    while ( 1 )
    {
        produce_item();
        P ( s );
        put_item();
        buffer = full;
        if ( buffer == full ) V ( delay );
        V ( s );
    }
}

void consumer()
{
    P ( delay );
    while ( 1 )
    {
        P ( s );
        get_item();
        buffer = empty;
        V ( s );
        consume_item();
        if ( buffer == empty ) P ( delay );
    }
}
```

7. [4 pt] What is the distinction between *blocking* and *nonblocking* with respect to messages?