CS 4760	Operating Systems	Test 2
Name:	Spring 2019	Max Pts: 54

Important: This is an open book test. You can use any books, notes, or paper. *Do not use any electronic or communications device. Change your cell phones to silent mode*. Any calculations and rough work can be done on the back side of the test pages. If there is a syntax error in any program segment, just write it down and you will get full credit for the problem. Please write legibly; if I cannot read what you wrote, I'll give you a zero. You will lose five points for not writing your name.

1. [6 pt] Differentiate between daemons and zombies.

2. [6 pt] What is a thundering herd?

3. [6 pt] Does the following code solve the producer-consumer problem? Explain your answer.

```
semaphore mutex;          // For exclusive access to buffers; initialized to 1
semaphore empty;          // Number of available buffers; initialized to n
semaphore full;           // Number of buffers with content; initialized to 0

void producer()
{
    while ( 1 )
    {
        produce ( item );
        mutex.P();
        empty.P();
        put ( item );
        full.V();
        mutex.V();
    }
}
```

```
void consumer()
{
    while ( 1 )
    {
        full.P();
        mutex.P();
        remove ( item );
        empty.V();
        mutex.V();
        consume ( item );
    }
}
```

4. [6 pt] Spin locks are implemented in Linux kernel using a busy-wait strategy. However, we noticed that busy-wait should be avoided because it results in waster of CPU time. What is the justification for having spin locks in Linux kernel?

5. [6 pt] What is the maximum number of process in a standard Linux installation? Why is the number of processes limited to this number? Can it be changed?

6. [12 pt] Assume you have the following jobs to execute with one processor:

Process	Burst time	Arrival time
p_0	1	0
p_1	8	0
p_2	3	4
p_3	7	9
p_4	6	9

Calculate and show the average wait time for this set of processes using the following algorithms. Specify the arbitration rule used for each algorithm, if needed. Assume no time taken by the scheduler except where context switch cost is mentioned. Show your work.

(a) First in first out

(b) Shortest job next

(c) Shortest remaining time next (pre-emptive)

(d) Round robin, with a quantum of 4

7. [6 pt] What is the difference between a blocked state and a deadlock state?

8. [6 pt] How do you define the state of the operating system?