Homework1 (CSE660- Winter 2008)
Processes and Scheduling

Due: Friday, Feb 1 (in class)
Please submit a hard copy in class.

Student Name (First, Last):_____

1. **Process (30 points)**

```
#include <…>

int value = 5;

int main()
{
    pid_t pid;
    pid = fork ();

    if (pid < 0) {
        printf (“failed to fork a new process.\n”);
        exit (1);
    }
    value += 15;
    printf(“pid=%d, value=%d\n”, pid, value);
}
```

The above C program creates a child process using the system call fork(). If the child process is created successfully, (1) what will be the output? (Assume the created new child process pid = 1000.) (2) How many lines will it output? If your answer is one line, then skip the next question. Otherwise, continue. (3) If we want to output the message only once, in the parent process, how will you modify the program?

2. CPU Scheduling I (40 points)

Assume some OS needs to schedule four processes using different scheduling algorithms. For each process, the following table shows its burst time (processing time), priority (The lower the number, the higher the priority), and arrival time.

Processes	Burst Time	Priority	Arrival Time
P1	12	3	0
P2	6	4	2
P3	4	1	4
P4	18	2	6

Table 1. Process Information

Questions: What is the Average Waiting Time of those processes for each of the following schedule algorithms? (Draw a Gantt Chart for each algorithm.)

1) First Come First Serve (FCFS)
2) Non-preemptive Shortest Job First (NP-SJF)
3) Preemptive Shortest Job First (P-SJF)
4) Priority Scheduling
5) Round-Robin (Assumptions 1: The scheduling time quantum is 5 time units. Assumption 2: If a new process arrives at the same time as the time slice of the executing process expires, the OS puts the executing process to the ready queue, followed by the new process.)

3. **CPU Scheduling II (BSD Scheduling):** This question is about BSD 4.4 scheduling algorithm. Suppose we have three processes, P1, P2, and P3. Let the 'nice' value for each of them be 0. At the time 0, their estimated CPU time is 0, 20, and 40 units, respectively, which means that their priority values are 50, 55, and 60, respectively. Assume that every clock tick is 0.01 seconds, time slice for CPU scheduling is 0.1 seconds, and the decay on the CPU utilization is applied every 1 seconds. Starting from the time 0, determine which process will be given the CPU each time slice, for the next 20 time slices (or 2 seconds). Further assume that there are only 3 processes at any time in the system, and when not given the CPU, each of these processes is in ready queue. **(30 points)**