1. Go through the steps that must take place in a context switch. Make sure that you give the
   conditions under which a context switch could actually occur. Give two scenarios, one that
   is the result of a program action, one that is not.
2. Define the term “System Call.” Give a list of the various system calls that could be
   performed by a program.
3. Explain the concept of memory protection, and why it is needed.
4. What kinds of things get saved in a PCB? Why do I need a PCB in the first place?
5. What are the three types of threading? How do they differ from one another.
6. When I use pthreads, what is the only way to switch from one thread to another?
7. In messaging, explain how a zero-capacity buffer system works. Contrast this with a
   buffered system.
8. Explain the difference between the fork and the clone system calls.
9. How does a new process get created?
10. When your program is running, what is the OS doing?
11. Given the following processes and burst times, give a gantt chart for each, compute the
    average wait time, the average turn-around time, and the average response time for the
    three algorithms, shortest remaining time first, first come first served, and round robin with a
    quantum of 3.

<table>
<thead>
<tr>
<th>Process</th>
<th>Burst Time</th>
<th>Arrival Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>P2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>P4</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>P5</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

12. Suppose the following two statements are executed simultaneously by two processes with
    no protection. The value of S is 10 before the statements are executed. What are the
    possible final values, and how can each occur?

shared int S = 10;

    Process 1                           Process 2
    …                                    …
    S = S + 5;                           S = S + 10;
    …                                    …