

## ENCS3390- Operating Systems

### Problem Set

October 2021

1. What is system call and what is its purpose?
2. What are the five major activities of an operating system with regard to process management?
3. What is the difference between user mode and kernel mode?
4. What is multiprogramming, and what is its purpose?
5. What is the main advantage of the layered approach to system design? What are the disadvantages of the layered approach?
6. What are the two models of interprocess communication? What are the strengths and weaknesses of the two approaches?
7. What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the microkernel approach?
8. What are the advantages of using loadable kernel modules?
9. When a process creates a new process using the fork () operation, which of the following states is shared between the parent process and the child process?

#### **(Stack, Heap, and Shared memory segments)**

10. Describe the actions taken by a kernel to context-switch between two processes.
11. What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?
12. Describe the actions taken by a kernel to context-switch between kernel-level threads.
13. What resources are used when a thread is created? How do they differ from those used when a process is created?
14. Is it possible to have concurrency but not parallelism? Explain.

15. Using Amdahl's Law, calculate the speedup gain of an application that has a 60 percent parallel component for (a) two processing cores and (b) four processing cores.
16. Including the initial parent process, how many processes are created by the program shown below?

```
#include <stdio.h>
#include <unistd.h>

int main()
{
    /* fork a child process */
    fork();

    /* fork another child process */
    fork();

    /* and fork another */
    fork();

    return 0;
}
```