CSCE 5640, Fall 2017
Project #1
Due: 10-30-2017

For this project you may be working in groups of two. Each member of your group **must** sign up on the corresponding project sheet in order to receive a grade. Your task is to implement a semaphore-based solution to the problem stated below.

> Consider a system with N blocks of storage, each of which holds one unit of information (e.g. an integer, character, or employee record). Initially, these blocks are empty and are linked onto a list called *freelist*. Three processes communicate using shared memory in the following manner:
>
> Shared Variables: freelist, list-1, list-2: block (where block is some data type to hold items)

```
PROCESS #1
var b: pointer to type block;
while (1)
{
 b:= unlink(freelist);
 produce_information_in_block(b);
 link(b, list1);
}
```

```
PROCESS #3
var c: pointer to type block;
while(1)
{
 c:=unlink(list-2);
 consume_information_in_block(c);
 link(c, freelist);
}
```

```
PROCESS #2
var x,y: pointer to type block;
while (1)
{
 x:=unlink(list-1);
 y:=unlink(freelist);
 use_block_x_to_produce info_in_y(x, y);
 link(x, freelist);
 link(y, list-2);
}
```

Using the appropriate libraries, rewrite the pseudo-code as actual Unix/Linux processes, using **semaphores** to implement the necessary mutual exclusion and synchronization. The solution must be deadlock-free and concurrency should not be unnecessarily restricted. Further, you will have to implement a correct representation of the three lists so that access to them is shared among the processes.

Deliverables: You must submit a working solution that compiles without errors on the CSE computers. Further, you must submit a detailed description of the approach you have used to solve the problem.

Grading: Your project will be graded on program correctness, particularly whether it is avoiding deadlocks and its ability to maximize concurrency among the three processes. Further, the detailed description of your approach regarding shared list implementation and the synchronization mechanisms used will weigh in the final project grade.