**Cigarette Smokers Problem**

In this assignment we were asked to write a program that consists of an agent process and

three smokers processes which needs three ingredients: tobacco, paper, and matches. The agent

has all three ingredients. In this problem, we would like to find a way to synchronize these four

processes in order to share the resources.

For the first part,

I was able to successfully synchronize these processes as only one process was allowed in

the critical section at any given time. The semaphores for the smokers were initialized to 0, so

they cannot run unless the agent supplies the materials first. Agent was also initialized to 0 so

that it will sleep after supplying the items. Finally, the lock mutex was initialized to 1. That way

the agent can run the first loop and will grant permission to the compatible smoker after

supplying the items. Then agent will sleep, until the smoker uses the materials and wakes up the

agent. The smokers all start off sleeping, and get woken up by agent when the items they need

are put on the table. The smokers which do not have the necessary ingredients will be sleeping

because the smokers cannot smoke without first being given the items by the agent. The agent

sleeps after putting the items, and is woken up by a smoker after the items have been used. By

initializing all the semaphores to 0 besides lock, it guarantees that they must wait for agent to be

done. Then the agent must also wait for smokers to be done to run again. In my code I also added

a sleep in each critical section to show that no process has entered the critical section while a

process is in there.

For the second part,

I was able to successfully synchronize using the thread. I first created 4 thread one for each smokers and a agent, then when the agent thread is running I locked the other thread and after the agent thread finished its job then this thread was locked and depending on the items the agent thread provided I unlocked the respected thread. To find out what items where given by the agent thread I created other helper thread that check the items and initialize the given value to 1 and looking at that value the respected smoker thread will operate and after the smoker thread finished it’s job it reset the value of the status of the items and lock itself.