Operating Systems-II
Theory_Assgn-Asgn-4

Task:

The goal of this assignment is to implement the ***Korean Restaurant problem***. To develop a Theoretical Solution to It.

Approach and Implementation:

To solve the problem I have used ***three binary*** semaphores. Two of them to update the shared variables and the other one to avoid Race conditions. The brief Pseudo Code is as follows:

```
#define N 5

sem_t cnt_lock = 1, grp_lock = 0, eat_lock=1;
bool grp_formed = 0;
int num_ppl_dining = 0;

// Entering restaurant
sem_wait(eat_lock);

sem_wait(cnt_lock); // Lock to update grp_formed (if needed)
if (num_ppl_dining == N)
 grp_formed = 1;
sem_post(cnt_lock);

if (grp_formed == 1) // If grp is formed sem_wait on grp_lock
 sem_wait(grp_lock);

sem_wait(cnt_lock);
num_ppl_dining++; // increment num_ppl_dining atomically
sem_post(cnt_lock);

sem_post(eat_lock);

// Exiting restaurant

sem_wait(cnt_lock); // decrement num_ppl_dining atomically
num_ppl_dining--;
sem_post(cnt_lock);

if (num_ppl_dining == 0 and grp_formed == 1) {

 sem_wait(cnt_lock); // Lock to update grp_formed
 grp_formed = 0;
 sem_post(cnt_lock);

 sem_post(grp_lock);
}
```

Explanation:

1. eat_lock - Semaphore used for entering into the restaurant and avoiding deadlocks
   cnt_lock - Semaphore used for updating the "grp_lock" variable and increasing the count of num_people dining.
   grp_lock - If a group is formed others wait on this semaphore for all others in the group to exit before the new group forms.

2. As the variables "grp_formed" and "num_ppl_dining" are related I have kept a single lock for modifying both of them.

3. When a person enters a restaurant, he grabs the eat_lock and then sees if any group was formed before and not all the people belonging to that group are yet exited.
   If any group wasn't formed. He simply goes and sits at the table.

4. If a group was formed before, the variable "grp_formed" becomes true and he waits on grp_lock till all the members of the group exit the table.

5. In exiting we just decrement the number of people dining and check whether to release the grp_lock and update the grp_formed boolean variable.