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29.Write a C program to simulate the solution of Classical Process Synchronization Problem

Aim:

To simulate the solution to the Classical Process Synchronization Problem (e.g., Producer-Consumer or Dining Philosophers) using C programming and demonstrate the correct functioning of process synchronization.

Algorithm (Dining Philosophers Example):

1. Initialize the state of philosophers as "thinking."
2. Use semaphores to control access to shared resources (chopsticks).
3. Define `pickup()` and `putdown()` functions to manage chopsticks.
4. A philosopher alternates between thinking and eating.
5. Ensure no deadlock or starvation occurs using a synchronization mechanism.

Procedure:

1. Create threads to represent philosophers.
2. Use semaphores for chopstick access.
3. Implement synchronization logic to prevent deadlock (e.g., wait-and-signal operations).
4. Run the program and observe how philosophers alternate between thinking and eating.

Code:

```
#include <pthread.h>

#include <semaphore.h>

#include <stdio.h>

#include <unistd.h>



#define N 5



sem_t chopstick[N];

pthread_t philosopher[N];
```

```
void* dine(void* arg) {
    int id = *(int*)arg;

    while (1) {
        printf("Philosopher %d is thinking.\n", id);
        sleep(1);

        sem_wait(&chopstick[id]);
        sem_wait(&chopstick[(id + 1) % N]);

        printf("Philosopher %d is eating.\n", id);
        sleep(1);

        sem_post(&chopstick[id]);
        sem_post(&chopstick[(id + 1) % N]);

        printf("Philosopher %d finished eating and starts thinking.\n", id);
    }
}

int main() {
    int id[N];
```

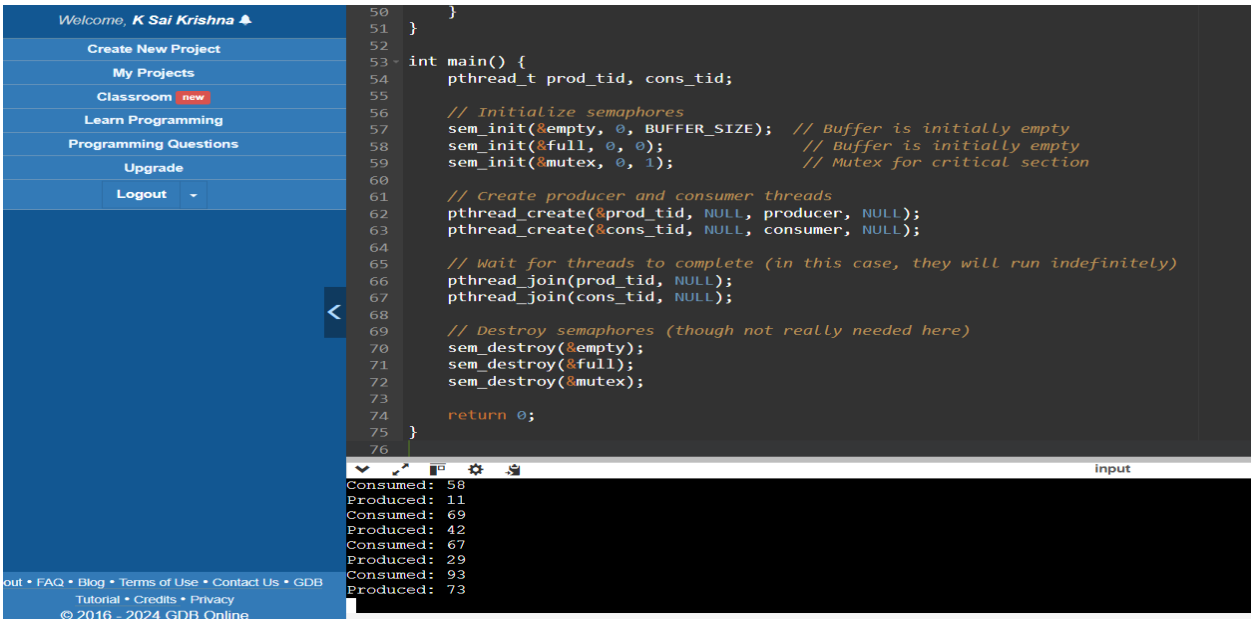
```
    for (int i = 0; i < N; i++) {
        sem_init(&chopstick[i], 0, 1);
        id[i] = i;
    }

    for (int i = 0; i < N; i++)
        pthread_create(&philosopher[i], NULL, dine, &id[i]);

    for (int i = 0; i < N; i++)
        pthread_join(philosopher[i], NULL);

    return 0;
}
```

Output:



Result:

The output of the program demonstrates that each philosopher alternates between thinking and eating, ensuring proper synchronization without deadlock or starvation.