Operating Systems
CT-353

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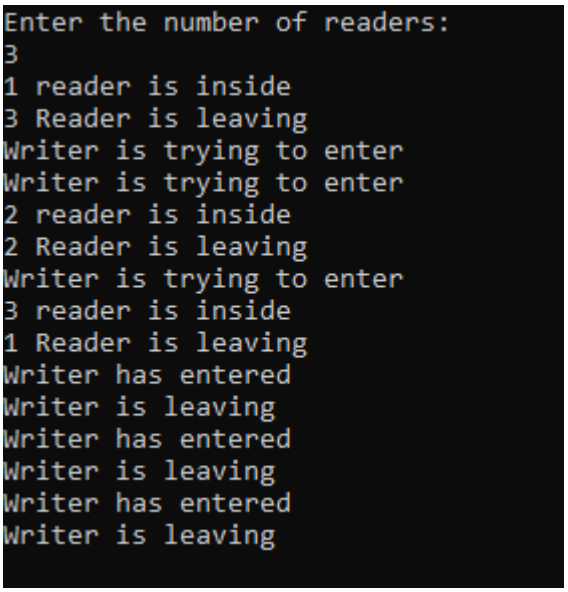
Lab 05:
Process Synchronization

- **Readers-Writers Problem:**

```
 #include <semaphore.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <pthread.h>

sem_t x, y;
pthread_t writerthreads[100], readerthreads[100];
int readercount = 0;

void *reader(void *param)
{
   sem_wait(&x);              // Lock the reader count
   readercount++;

   if (readercount == 1)       // First reader locks the writer
      sem_wait(&y);

   sem_post(&x);              // Release the reader count lock
   printf("%d reader is inside\n", readercount);
   usleep(3);                 // Simulate reading
   sem_wait(&x);              // Lock the reader count
   readercount--;

   if (readercount == 0)       // Last reader releases the writer
      sem_post(&y);

   sem_post(&x);              // Release the reader count lock
   printf("%d Reader is leaving\n", readercount + 1);  // Corrected print
   return NULL;
}
```

```
void *writer(void *param)
{
   printf("Writer is trying to enter\n");
   sem_wait(&y);               // Lock writer access
   printf("Writer has entered\n");
   sem_post(&y);               // Release writer lock
   printf("Writer is leaving\n");
   return NULL;
}

int main()
{
   int n2, i;
   printf("Enter the number of readers:\n");
   scanf("%d", &n2);

   // Initialize semaphores
   sem_init(&x, 0, 1);  // Mutex for reader count
   sem_init(&y, 0, 1);  // Semaphore for writer access

   // Create reader and writer threads
   for (i = 0; i < n2; i++)
   {
          pthread_create(&readerthreads[i], NULL, reader, NULL);   // Create reader
thread
      pthread_create(&writerthreads[i], NULL, writer, NULL);  // Create writer thread
   }

   // Wait for threads to finish
   for (i = 0; i < n2; i++)
   {
      pthread_join(readerthreads[i], NULL);
      pthread_join(writerthreads[i], NULL);
   }

   // Destroy semaphores
   sem_destroy(&x);
   sem_destroy(&y);

   return 0;
}
```

Output:


Enter the number of readers:
3
1 reader is inside
3 Reader is leaving
Writer is trying to enter
Writer is trying to enter
2 reader is inside
2 Reader is leaving
Writer is trying to enter
3 reader is inside
1 Reader is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving