

PRODUCER CONSUMER:

```
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h> // for sleep()
#include <time.h> // for time()
#define MAX 5
int buffer[MAX], in = 0, out = 0;
sem_t empty, full, mutex;
void *producer(void *param) {
    int item;
    while (1) {
        item = rand() % 100;
        sem_wait(&empty);
        sem_wait(&mutex);
        buffer[in] = item;
        printf("Produced: %d\n", item);
        in = (in + 1) % MAX;
        sem_post(&mutex);
        sem_post(&full);
        sleep(1);
    }
}

void *consumer(void *param) {
    int item;
    while (1) {
        sem_wait(&full);
        sem_wait(&mutex);
        item = buffer[out];
        printf("Consumed: %d\n", item);
        out = (out + 1) % MAX;
        sem_post(&mutex);
        sem_post(&empty);
        sleep(1);
    }
}

int main() {
    pthread_t prod_thread, cons_thread;
    srand(time(NULL)); // Seed for random numbers
    sem_init(&empty, 0, MAX);
    sem_init(&full, 0, 0);
    sem_init(&mutex, 0, 1);
```

```
pthread_create(&prod_thread, NULL, producer, NULL);  
pthread_create(&cons_thread, NULL, consumer, NULL);  
pthread_join(prod_thread, NULL);  
pthread_join(cons_thread, NULL);  
sem_destroy(&empty);  
sem_destroy(&full);  
sem_destroy(&mutex);  
return 0;  
}
```

```
Produced: 20  
Consumed: 20  
Produced: 7  
Consumed: 7  
Produced: 86  
Consumed: 86  
Produced: 75  
Consumed: 75  
Produced: 52  
Consumed: 52  
Produced: 15  
Consumed: 15  
Produced: 21  
Consumed: 21  
Produced: 57  
Consumed: 57  
Produced: 34  
Consumed: 34  
Produced: 67
```