

Program :

```
#include <pthread.h>
#include <semaphore.h>
#include <stdlib.h>
#include <stdio.h>
#define MaxItems 5
#define BufferSize 5
sem_t empty;
sem_t full;
int in = 0;
int out = 0;
int buffer[BufferSize];
pthread_mutex_t mutex;
void *producer(void *pno)
{
    int item;
    for(int i = 0; i < MaxItems; i++) {
        item = rand();
        sem_wait(&empty);
        pthread_mutex_lock(&mutex);
        buffer[in] = item;
        printf("Producer %d: Insert Item %d at %d\n", *((int *)pno), buffer[in], in);
        in = (in+1)%BufferSize;
        pthread_mutex_unlock(&mutex);
        sem_post(&full);
    }
}
void *consumer(void *cno)
{
    for(int i = 0; i < MaxItems; i++) {
        sem_wait(&full);
        pthread_mutex_lock(&mutex);
        int item = buffer[out];
        printf("Consumer %d: Remove Item %d from %d\n", *((int *)cno), item, out);
        out = (out+1)%BufferSize;
        pthread_mutex_unlock(&mutex);
        sem_post(&empty);
    }
}
int main()
{
    pthread_t pro[5], con[5];
    pthread_mutex_init(&mutex, NULL);
    sem_init(&empty, 0, BufferSize);
    sem_init(&full, 0, 0);
    int a[5] = {1,2,3,4,5};
    for(int i = 0; i < 5; i++) {
        pthread_create(&pro[i], NULL, (void *)producer, (void *)&a[i]);
    }
    for(int i = 0; i < 5; i++) {
        pthread_create(&con[i], NULL, (void *)consumer, (void *)&a[i]);
    }
}
```

```

}for(int i = 0; i < 5; i++) {
pthread_join(pro[i], NULL);
}
for(int i = 0; i < 5; i++) {
pthread_join(con[i], NULL);
}
pthread_mutex_destroy(&mutex);
sem_destroy(&empty);
sem_destroy(&full);
return 0;
}

```

Output :

```

admin1@admin1-MS-7D48: ~/Desktop/Aditya_070
admin1@admin1-MS-7D48:~/Desktop/Aditya_070$ ./a.out
Producer 1: Insert Item 1804289383 at 0
Producer 4: Insert Item 1714636915 at 1
Producer 2: Insert Item 846930886 at 2
Producer 3: Insert Item 1681692777 at 3
Consumer 2: Remove Item 1804289383 from 0
Consumer 4: Remove Item 1714636915 from 1
Consumer 1: Remove Item 846930886 from 2
Producer 4: Insert Item 424238335 at 4
Producer 2: Insert Item 1649760492 at 0
Consumer 4: Remove Item 1681692777 from 3
Consumer 4: Remove Item 424238335 from 4
Consumer 2: Remove Item 1649760492 from 0
Producer 5: Insert Item 719885386 at 1
Producer 5: Insert Item 1350490027 at 2
Consumer 5: Remove Item 719885386 from 1
Producer 2: Insert Item 1025202362 at 3
Consumer 3: Remove Item 1350490027 from 2
Producer 2: Insert Item 1102520059 at 4
Producer 4: Insert Item 1189641421 at 0
Producer 3: Insert Item 596516649 at 1
Consumer 5: Remove Item 1025202362 from 3
Consumer 5: Remove Item 1102520059 from 4
Consumer 5: Remove Item 1189641421 from 0
Producer 4: Insert Item 1967513926 at 2
Producer 4: Insert Item 1540383426 at 3
Consumer 5: Remove Item 596516649 from 1
Consumer 1: Remove Item 1967513926 from 2
Producer 2: Insert Item 2044897763 at 4
Consumer 4: Remove Item 1540383426 from 3
Consumer 4: Remove Item 2044897763 from 4
Producer 1: Insert Item 1957747793 at 0
Producer 1: Insert Item 304089172 at 1
Producer 5: Insert Item 783368690 at 2
Producer 1: Insert Item 1303455736 at 3
Consumer 3: Remove Item 1957747793 from 0
Producer 3: Insert Item 1365180540 at 4
Producer 3: Insert Item 294702567 at 0
Consumer 2: Remove Item 304089172 from 1
Consumer 2: Remove Item 783368690 from 2
Consumer 2: Remove Item 1303455736 from 3
Producer 3: Insert Item 1726956429 at 1
Producer 1: Insert Item 521595368 at 2
Consumer 3: Remove Item 1365180540 from 4
Consumer 3: Remove Item 294702567 from 0
Consumer 3: Remove Item 1726956429 from 1
Consumer 1: Remove Item 521595368 from 2
Producer 5: Insert Item 35005211 at 3
Producer 5: Insert Item 336465782 at 4
Consumer 1: Remove Item 35005211 from 3
Consumer 1: Remove Item 336465782 from 4
admin1@admin1-MS-7D48:~/Desktop/Aditya_070$

```