CODE:

```c
#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(); // Produce an random item
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++)
{
```

```c
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}; //Just used for numbering the producer and consumer

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 :

Producer 1: Insert Item 1804289383 at 0

Producer 1: Insert Item 1714636915 at 1

Producer 1: Insert Item 1957747793 at 2

Producer 2: Insert Item 846930886 at 3

Consumer 1: Remove Item 1804289383 from 0

Consumer 1: Remove Item 1714636915 from 1

Consumer 1: Remove Item 1957747793 from 2

Consumer 1: Remove Item 846930886 from 3

Producer 3: Insert Item 1681692777 at 4

Producer 3: Insert Item 1189641421 at 0

Producer 1: Insert Item 424238335 at 1

Consumer 5: Remove Item 1681692777 from 4

Producer 3: Insert Item 1025202362 at 2

Consumer 1: Remove Item 1189641421 from 0

Consumer 3: Remove Item 424238335 from 1

Producer 4: Insert Item 719885386 at 3

Producer 5: Insert Item 1649760492 at 4

Consumer 4: Remove Item 1025202362 from 2

Producer 2: Insert Item 596516649 at 0

Producer 1: Insert Item 1350490027 at 1

Consumer 4: Remove Item 719885386 from 3

Producer 4: Insert Item 1102520059 at 2

Consumer 2: Remove Item 1649760492 from 4

Producer 3: Insert Item 783368690 at 3

Consumer 2: Remove Item 596516649 from 0

Consumer 3: Remove Item 1350490027 from 1

Producer 2: Insert Item 1967513926 at 4

Consumer 4: Remove Item 1102520059 from 2

Consumer 5: Remove Item 783368690 from 3

Producer 4: Insert Item 1365180540 at 0

Producer 2: Insert Item 304089172 at 1

Producer 5: Insert Item 2044897763 at 2

Consumer 2: Remove Item 1967513926 from 4

Consumer 4: Remove Item 1365180540 from 0

Producer 3: Insert Item 1540383426 at 3

Producer 2: Insert Item 35005211 at 4

Consumer 3: Remove Item 304089172 from 1

Consumer 5: Remove Item 2044897763 from 2

Consumer 2: Remove Item 1540383426 from 3

Producer 4: Insert Item 1303455736 at 0

Producer 4: Insert Item 294702567 at 1

Producer 5: Insert Item 521595368 at 2

Producer 5: Insert Item 1726956429 at 3

Consumer 3: Remove Item 35005211 from 4

Consumer 3: Remove Item 1303455736 from 0

Producer 5: Insert Item 336465782 at 4

Consumer 5: Remove Item 294702567 from 1

Consumer 5: Remove Item 521595368 from 2

Consumer 4: Remove Item 1726956429 from 3

Consumer 2: Remove Item 336465782 from 4