NAME: MUHAMMAD SAIM NOMANI
ROLL NO: DT-22030
SUBJECT: OPERATING SYSTEM
CODE: CT-353
LAB: 05
DATA SCIENCE
THIRD YEAR

Exercise:

1) Implement the above code and paste the screen shot of the output.

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

sem_t x, y;  // Semaphores for synchronization
pthread_t writerthreads[100], readerthreads[100];  // Arrays for thread IDs
int readercount = 0;  // Count of active readers

// Reader function
void *reader(void *param) {
    sem_wait(&x);  // Lock access to reader count
    readercount++;

    if (readercount == 1)  // If first reader, lock the writer semaphore
        sem_wait(&y);

    sem_post(&x);  // Unlock access to reader count

    // Reading
    printf("%d reader is inside\n", readercount);
    usleep(3000);  // Simulate reading with a delay

    sem_wait(&x);  // Lock access to reader count again
    readercount--;

    if (readercount == 0)  // If last reader, unlock writer semaphore
        sem_post(&y);

    sem_post(&x);  // Unlock access to reader count
    printf("%d Reader is leaving\n", readercount + 1);

    return NULL;
}

// Writer function
void *writer(void *param) {
    printf("Writer is trying to enter\n");
```

```c
    sem_wait(&y);  // Lock access for writers

    // Writing
    printf("Writer has entered\n");
    usleep(3000);  // Simulate writing with a delay
    printf("Writer is leaving\n");

    sem_post(&y);  // Unlock access for other writers

    return NULL;
}

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

    // Initialize semaphores
    sem_init(&x, 0, 1);
    sem_init(&y, 0, 1);

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

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

    return 0;
}
```

```
Enter the number of readers: 3

1 reader is inside
Writer is trying to enter
2 reader is inside
Writer is trying to enter
3 reader is inside
Writer is trying to enter
3 Reader is leaving
2 Reader is leaving
1 Reader is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving
Writer has entered
Writer is leaving
```