# 20. Construct a C program to simulate Reader-Writer problem using Semaphores.

#include <stdio.h>  
#include <pthread.h>  
#include <semaphore.h>  
#include <unistd.h>  
  
sem\_t mutex, wrt;  
int readcount = 0;  
  
void \*reader(void \*arg) {  
 sem\_wait(&mutex);  
 readcount++;  
 if (readcount == 1)  
 sem\_wait(&wrt);  
 sem\_post(&mutex);  
  
 printf("Reader %d is reading\n", \*(int \*)arg);  
 sleep(1);  
  
 sem\_wait(&mutex);  
 readcount--;  
 if (readcount == 0)  
 sem\_post(&wrt);  
 sem\_post(&mutex);  
 return NULL;  
}  
  
void \*writer(void \*arg) {  
 sem\_wait(&wrt);  
 printf("Writer %d is writing\n", \*(int \*)arg);  
 sleep(1);  
 sem\_post(&wrt);  
 return NULL;  
}  
  
int main() {  
 pthread\_t r[5], w[5];  
 int ids[5] = {1, 2, 3, 4, 5};  
 sem\_init(&mutex, 0, 1);  
 sem\_init(&wrt, 0, 1);  
  
 for (int i = 0; i < 3; i++)  
 pthread\_create(&r[i], NULL, reader, &ids[i]);  
 for (int i = 0; i < 2; i++)  
 pthread\_create(&w[i], NULL, writer, &ids[i]);  
  
 for (int i = 0; i < 3; i++)  
 pthread\_join(r[i], NULL);  
 for (int i = 0; i < 2; i++)  
 pthread\_join(w[i], NULL);  
  
 sem\_destroy(&mutex);  
 sem\_destroy(&wrt);  
 return 0;  
}