운영체제 과제 2

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1번 코드

```c
#include <pthread.h>
#include <stdint.h>

void *add(), *sub();

volatile int Count = 0;

int main(int ac, char *av[])
{
pthread_t thread1, thread2;

pthread_create(&thread1, NULL, add, (void *)(intptr_t)10000000);
pthread_create(&thread2, NULL, sub, (void *)(intptr_t)10000000);

pthread_join(thread1, NULL);
pthread_join(thread2, NULL);

printf("Count = %d\n", Count);

return 0;
}

void *add(void *ap)
{
int v, i;
intptr_t n = (intptr_t)ap;

for (i = 0; i < n; i++) {
v = 1;
Count += v;
if (i && (i%2000000 == 0))
printf("add() : %ld...\n", (long)i);
}

return NULL;
}

void *sub(void *ap)
{
int v, i;
intptr_t n = (intptr_t)ap;

for (i = 0; i < n; i++) {
v = 1;
Count -= v;
if (i && (i%2000000 == 0))
printf("sub() : %ld...\n", (long)i);
}

return NULL;
}
```

```
octopus@sonseunghyeon-ui-MacBookAir test % vi prog_06_12_t.c
octopus@sonseunghyeon-ui-MacBookAir test % cc prog_06_12_t.c -o prog_06_12_t
octopus@sonseunghyeon-ui-MacBookAir test % sudo ./prog_06_12_t
```

1번 결과

```
[Password:
sub() : 2000000...
add() : 2000000...
add() : 4000000...
sub() : 4000000...
add() : 6000000...
sub() : 6000000...
add() : 8000000...
sub() : 8000000...
Count = -2963122
octopus@sonseunghyeon-ui-MacBookAir test % ./prog_06_12_t

sub() : 2000000...
add() : 2000000...
add() : 4000000...
sub() : 4000000...
add() : 6000000...
sub() : 6000000...
add() : 8000000...
sub() : 8000000...
Count = 804838
octopus@sonseunghyeon-ui-MacBookAir test % ./prog_06_12_t

sub() : 2000000...
add() : 2000000...
sub() : 4000000...
add() : 4000000...
sub() : 6000000...
add() : 6000000...
sub() : 8000000...
add() : 8000000...
Count = 5286654
octopus@sonseunghyeon-ui-MacBookAir test % ./prog_06_12_t

sub() : 2000000...
add() : 2000000...
sub() : 4000000...
add() : 4000000...
sub() : 6000000...
add() : 6000000...
sub() : 8000000...
add() : 8000000...
Count = -3909267
octopus@sonseunghyeon-ui-MacBookAir test %
```

2번 코드

```
/*-------------------------------------------*/
/*          prog_06_62.c                     */
/*        Semaphore Mutual Exclusion         */
/* (UNIX/LINUX POSIX thread based)           */
/*-------------------------------------------*/

#include <stdio.h>
#include <pthread.h>
#include <stdint.h> // For intptr_t

void *add(void *ap);
void *sub(void *ap);
int do_something();

volatile int Count = 0;
pthread_mutex_t Mutex = PTHREAD_MUTEX_INITIALIZER;

void *add(void *ap)
{
   intptr_t n;
   int v, i;

   n = (intptr_t)ap;

   for (i = 0; i < n; i++) {
      v = do_something();

      pthread_mutex_lock(&Mutex);

      Count += v;

      pthread_mutex_unlock(&Mutex);

      if (i && (i%2000000 == 0))
         printf("add() : %d...₩n", i);
   }

   pthread_exit((void *)NULL);
}

void *sub(void *ap)
{
   intptr_t n;
   int v, i;

   n = (intptr_t)ap;

   for (i = 0; i < n; i++) {
      v = do_something();
```

```
        pthread_mutex_lock(&Mutex);

        Count -= v;

        pthread_mutex_unlock(&Mutex);

        if (i && (i%2000000 == 0))
            printf("sub() : %d...₩n", i);
    }

    pthread_exit((void *)NULL);
}

int main(int ac, char *av[])
{
    pthread_t thread1, thread2;

    pthread_create(&thread1, NULL, add, (void *)10000000);
    pthread_create(&thread2, NULL, sub, (void *)10000000);

    pthread_join(thread1, NULL);
    pthread_join(thread2, NULL);

    printf("Count = %d₩n", Count);

    return 0;
}

int do_something()
{
    return (1);
}
```

2번 결과

```
[octopus@sonseunghyeon-ui-MacBookAir test % vi prog_06_62.c
[octopus@sonseunghyeon-ui-MacBookAir test % cc prog_06_62.c -o prog_06_62
[octopus@sonseunghyeon-ui-MacBookAir test % sudo ./prog_06_62
[Password:
sub() : 2000000...
add() : 2000000...
sub() : 4000000...
add() : 4000000...
sub() : 6000000...
add() : 6000000...
sub() : 8000000...
add() : 8000000...
Count = 0
[octopus@sonseunghyeon-ui-MacBookAir test % ./prog_06_62
sub() : 2000000...
add() : 2000000...
sub() : 4000000...
add() : 4000000...
sub() : 6000000...
add() : 6000000...
sub() : 8000000...
add() : 8000000...
Count = 0
octopus@sonseunghyeon-ui-MacBookAir test %
```