BÀI THỰC HÀNH LAB 05

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Bài 1:
Code:

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

sem_t sem;
int sells=0, products=0;

void *processA(){
    while(1){
        sem_wait(&sem);
        printf("sells = %d\n", sells);
        sells++;
    }
}

void *processB(){
    while(1){
        // MSSV: 20520720
        if(products<=sells+20+10){
            products++;
            printf("products = %d\n", products);
            sem_post(&sem);
        }

    }
}

void main()
{
    sem_init(&sem,0,0);      //pshare = 0 to share it with other process, and value = 0
    pthread_t th1, th2;
    pthread_create(&th1, NULL, &processA, NULL);
    pthread_create(&th2, NULL, &processB, NULL);
    while(1);
}
```

Kết quả:

```
sells = 56822
sells = 56823
sells = 56824
products = 56826
products = 56827
products = 56828
products = 56829
products = 56830
products = 56831
products = 56832
products = 56833
products = 56834
products = 56835
products = 56836
products = 56837
products = 56838
products = 56839
products = 56840
products = 56841
products = 56842
products = 56843
products = 56844
products = 56845
products = 56846
products = 56847
products = 56848
products = 56849
products = 56850
products = 56851
products = 56852
products = 56853
products = 56854
products = 56855
products = 56856
sells = 56825
sells = 56826
sells = 56827
sells = 56828
```

Bài 2:

```c
1    #include<stdio.h>
2    #include<stdlib.h>
3    #include<time.h>
4    #include<pthread.h>
5    #include<semaphore.h>
6    #include <unistd.h>
7
8    sem_t sem1, sem2;
9    int n;
10   int i = 0;
11   static int dem = 0;
12   int a[1000];
13   void* PROCESS1()
14   {
15       while (1)
16       {
17           if (dem < n) {
18               a[i++] = rand() % (n - 1);
19               dem++;
20               printf("\n[PUSH] Number of elements in array a: %2d", dem);
21
22           }
23           // sleep to easily print of result
24           int time_sleep = rand() % 2 + 1;
25           sleep(time_sleep);
26
27           sem_post(&sem1);
28       }
29   }
30   void* PROCESS2()
31   {
32       int j, b;
33       while (1)
34       {
35           sem_wait(&sem1);
36
37
38           if (dem == 0)
39           {
40               printf("\n[POP] Nothing in array a");
41           }
42           else
```

```
43          {
44              dem--;
45              b = a[0];
46              for (j = 0; j < dem; j++)
47              {
48                  a[j] = a[j + 1];
49              }
50
51              printf("\n[POP] Number of elements in array a: %2d", dem);
52          }
53
54          // sleep to easily print of result
55          int time_sleep = rand() % 2 + 1;
56          sleep(time_sleep);
57      }
58  }
59  void main()
60  {
61      sem_init(&sem1, 1, 0);
62      sem_init(&sem2, 0, 0);
63      printf("\nEnter n: ");
64      scanf("%d",&n);
65      pthread_t th1, th2;
66      pthread_create(&th1, NULL, PROCESS1, NULL);
67      pthread_create(&th2, NULL, PROCESS2, NULL);
68      while(1);
69
70  }
```

Kết quả:

```
Enter n: 10

[PUSH] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[POP] Number of elements in array a:  1
[PUSH] Number of elements in array a:  2
[PUSH] Number of elements in array a:  3
[POP] Number of elements in array a:  2
[PUSH] Number of elements in array a:  3
[POP] Number of elements in array a:  2
^C
```

Bài 3:

```c
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>
int x = 0;
void* A()
{
    while (1)
    {
        x = x + 1;
        if (x == 20)
        {
            x = 0;
        }
        printf("PA: x = %d\n", x);
    }
}
void* B()
{
    while (1)
    {
        x = x + 1;
        if (x == 20)
        {
            x = 0;
        }
        printf("PB: x = %d\n", x);
    }
    sleep(1);
}
void main()
{
    pthread_t th1, th2;
    pthread_create(&th1, NULL, &A, NULL);
    pthread_create(&th2, NULL, &B, NULL);;
    while (1);
}
```

Kết quả: Điểm bất hợp lí là kết quả in ra đã bị bỏ xót một vài số

```
PB: x = 14
PB: x = 15
PB: x = 16
PB: x = 17
PB: x = 18
PB: x = 19
PB: x = 0
PB: x = 2
PB: x = 3
PB: x = 4
PB: x = 5
PB: x = 6
PB: x = 7
PB: x = 8
PB: x = 9
PB: x = 10
PB: x = 11
PB: x = 12
PB: x = 13
PB: x = 14
PB: x = 15
PB: x = 16
PB: x = 17
PB: x = 18
PB: x = 19
PB: x = 0
PB: x = 1
PB: x = 2
PB: x = 3
PB: x = 4
PB: x = 5
PB: x = 6
PB: x = 7
PA: x = 1
```

Bài 4:

```c
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
sem_t sem_1, sem_2;
int x = 0;
pthread_mutex_t mutex;
void* PROCESS1()
{
    while (1)
    {
        pthread_mutex_lock(&mutex);
        x++;
        if (x == 20)
        {
            x = 0;
        }
        printf("PA: x = %d\n", x);
        pthread_mutex_unlock(&mutex);

    }
}
void* PROCESS2()
{
    while (1)
    {
        pthread_mutex_lock(&mutex);
        x++;
        if (x == 20)
        {
            x = 0;
        }
        printf("PB: x = %d\n", x);
        pthread_mutex_unlock(&mutex);
    }
}
void main()
{
    pthread_mutex_init(&mutex, NULL);
    pthread_t th1, th2;
    pthread_create(&th1, NULL, &PROCESS1, NULL);
    pthread_create(&th2, NULL, &PROCESS2, NULL);
    while (1);
}
```

Kết quả:

```
PA: x = 0
PA: x = 1
PA: x = 2
PA: x = 3
PA: x = 4
PA: x = 5
PA: x = 6
PA: x = 7
PA: x = 8
PA: x = 9
PA: x = 10
PA: x = 11
PA: x = 12
PA: x = 13
PA: x = 14
PA: x = 15
PA: x = 16
PA: x = 17
PA: x = 18
PA: x = 19
PA: x = 0
PA: x = 1
PA: x = 2
PA: x = 3
PA: x = 4
PA: x = 5
PA: x = 6
PA: x = 7
PA: x = 8
PA: x = 9
PA: x = 10
PA: x = 11
PA: x = 12
PA: x = 13
PA: x = 14
PA: x = 15
PA: x = 16
```

Bài 5:

```c
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>
sem_t p1_5, p1_6, p2_3, p2_4, p3_5, p4_6, p5_7, p6_7;
int x1 = 1;
int x2 = 2;
int x3 = 3;
int x4 = 4;
int x5 = 5;
int x6 = 6;
int w, v, z, y, x;
int ans = 0;
void* PROCESS1()
{
    w = x1 * x2;
    printf("w = %d\n", w);
    sem_post(&p1_5);
    sem_post(&p1_6);
    sleep(1);
}
void* PROCESS2()
{
    v = x3 * x4;
    printf("v = %d\n", v);
    sem_post(&p2_3);
    sem_post(&p2_4);
    sleep(1);
}
void* PROCESS3()
{
    sem_wait(&p2_3);
    printf("y = %d\n", y);
    y = v * x5;
    sem_post(&p3_5);
    sleep(1);
}
void *PROCESS4()
{
    sem_wait(&p2_4);
    printf("z = %d\n", z);
    z = v * x6;
    sem_post(&p4_6);
    sleep(1);
}
```

```
47  void *PROCESS5()
48  {
49      sem_wait(&p1_5);
50      sem_wait(&p3_5);
51      y = w * y;
52      printf("y = %d\n", y);
53      sem_post(&p5_7);
54      sleep(1);
55  }
56  void *PROCESS6()
57  {
58      sem_wait(&p1_6);
59      sem_wait(&p4_6);
60      z = w * z;
61      printf("z = %d\n", z);
62      sem_post(&p6_7);
63      sleep(1);
64  }
65  void* PROCESS7()
66  {
67      sem_wait(&p5_7);
68      sem_wait(&p6_7);
69      ans = y + z;
70      printf("ans = %d\n", ans);
71      sleep(1);
72  }
73  void main()
74  {
75      sem_init(&p1_5, 0, 1);
76      sem_init(&p1_6, 0, 0);
77      sem_init(&p2_3, 0, 0);
78      sem_init(&p2_4, 0, 0);
79      sem_init(&p3_5, 0, 0);
80      sem_init(&p4_6, 0, 0);
81      sem_init(&p5_7, 0, 0);
82      sem_init(&p6_7, 0, 0);
83      pthread_t th1, th2, th3, th4, th5, th6, th7;
84      pthread_create(&th1, NULL, &PROCESS1, NULL);
85      pthread_create(&th2, NULL, &PROCESS2, NULL);
86      pthread_create(&th3, NULL, &PROCESS3, NULL);
87      pthread_create(&th4, NULL, &PROCESS4, NULL);
88      pthread_create(&th5, NULL, &PROCESS5, NULL);
89      pthread_create(&th6, NULL, &PROCESS6, NULL);
90      pthread_create(&th7, NULL, &PROCESS7, NULL);
91      while (1);
92  }
```

Kết quả:

```
(base) quang@quang-FX503VM:~/Code/IT007/TH05$ ./Bai5
w = 6
v = 20
y = 0
y = 720
z = 0
z = 840
ans = 1560
```