

長庚大學107學年度第一學期 作業系統 第三次小考

系級:

姓名:

學號:

1. (30%) There are three processes:

- P<sub>1</sub>:  $a * b \rightarrow a$
- P<sub>2</sub>:  $a + c \rightarrow a$
- P<sub>3</sub>:  $a + d \rightarrow a$

P<sub>1</sub> should run before P<sub>2</sub> and P<sub>3</sub> do. The access to valuable “a” must be protected in a critical session. The order of P<sub>2</sub> and P<sub>3</sub> is arbitrary. We have only one semaphore, and it is initialized as S<sub>1</sub>=0. Now, the code of P<sub>1</sub> is provided as follows:

```
a = a * b;
signal(S1);
```

Please provide the code of P<sub>2</sub> and P<sub>3</sub>.

Answer:

Process P<sub>2</sub>:

```
wait(S1);
a = a + c;
signal(S1);
```

Process P<sub>3</sub>:

```
wait(S1);
a = a + d;
signal(S1);
```

2. (30%) There are three processes:

- P<sub>1</sub>:  $a * b \rightarrow a$
- P<sub>2</sub>:  $a + c \rightarrow a$
- P<sub>3</sub>:  $b + d \rightarrow b$

The access to valuables “a” and “b” must be protected in critical sessions. P<sub>3</sub> should run before P<sub>1</sub>. We have two semaphores, and they are initialized as S<sub>1</sub>=1 and S<sub>2</sub>=0. Now, the code of P<sub>1</sub> is provided as follows:

```
wait(S2);
wait(S1);
a = a * b;
signal(S1);
```

Please provide the code of P<sub>2</sub> and P<sub>3</sub>.

Answer:

Process P<sub>2</sub>:

```
wait(S1);
a = a + c;
signal(S1);
```

Process P<sub>3</sub>:

```
b = b + d;
signal(S2);
```

2. (40%) For the reader and writers problem, please complete the following code:

```
semaphore wrt, mutex;
(initialized to 1);
int readcount=0;
```

Writer:

```
wait(wrt);
.....
writing is performed
.....
signal(wrt)
```

Reader:

```
wait(mutex);
readcount++;
if (readcount == 1)
    wait(wrt);
signal(mutex);
... reading...
wait(mutex);
readcount--;
if (readcount == 0)
    signal(wrt);
signal(mutex);
```