

Quiz Sheet #2

Problem 2.1: *basic concepts*

(1+2+1 = 4 points)

Briefly answer the following questions.

- a) What is starvation?
- b) Semaphore operations are atomic. What does this mean and why is it required that semaphore operations are atomic?
- c) What is a barrier?

Problem 2.2: readers / writers problem

(2+2+2 = 6 points)

Below are several solutions of the readers / writers problem. Which ones are correct and which ones are incorrect? Explain why. Below are some common definitions:

```
shared object data;
shared int readcount = 0;
semaphore mutex = 1, writer = 1;
```

a) Solution 1:

```
void reader()
{
    down(&mutex);
    readcount = readcount + 1;
    if (readcount == 1) down(&writer);
    up(&mutex)
    read_shared_object(&data);
    down(&mutex);
    readcount = readcount - 1;
    if (readcount == 0) up(&writer);
    up(&mutex);
}

void writer()
{
    down(&writer);
    down(&mutex);
    write_shared_object(&data);
    up(&mutex);
    up(&writer);
}
```

b) Solution 2:

```
void reader()
{
    down(&mutex);
    readcount = readcount + 1;
    if (readcount == 1) down(&writer);
    up(&mutex)
    read_shared_object(&data);
    down(&mutex);
    readcount = readcount - 1;
    up(&mutex);
    if (readcount == 0) up(&writer);
}

void writer()
{
    down(&writer);
    write_shared_object(&data);
    up(&writer);
}
```

c) Solution 3:

```
void reader()
{
    down(&mutex);
    readcount = readcount + 1;
    if (readcount == 1) down(&writer);
    up(&mutex)
    read_shared_object(&data);
    down(&mutex);
    readcount = readcount - 1;
    if (readcount == 0) {
        up(&mutex);
        up(&writer);
    } else {
        up(&mutex);
    }
}

void writer()
{
    down(&writer);
    write_shared_object(&data);
    up(&writer);
}
```