(1) Define test-and-set instruction.

(2) Why is it necessary to use a special instruction such as test-and-set to implement semaphores in multiprocessor systems?

(3) What could be problems with the following implementation of V for multiprocessor semaphore? Explain clearly the situation and the consequences of the problem. TAS represents "test-and-set" operation.

```c
typedef struct {
    int count;
    queue q;
    int t;
} SEMAPHORE;

V(s)
SEMAPHORE *s;
{
    while (TAS(s->t) != 0) /* do nothing */;
    Disable interrupts;
    if (s->q empty) {
        s->count += 1;
    } else {
        Remove first process from s->q;
        Wake it up;
    }
    s->t = 0;
    Enable interrupts;
}
```