

```
1 typedef struct{
2     int space;           //number of free resources
3     struct process *P;  //a list of queueing producers
4     struct process *C;  //a list of queueing consumers
5 } semaphore;
6 semaphore S;
7 S.space = 5;
```

```
1 void down(S){
2     S.space--;
3     if(S.space == 4){
4         rmFromQueue(S.C);
5         wakeup(S.C);
6     }
7     if(S.space < 0){
8         addToQueue(S.P);
9         sleep();
10    }
11 }
```

```
1 void up(S){
2     S.space++;
3     if(S.space > 5){
4         addToQueue(S.C);
5         sleep();
6     }
7     if(S.space >= 0){
8         rmFromQueue(S.P);
9         wakeup(S.P);
10    }
11 }
```