Course ECE354 Real-time Operating Systems

Quiz 2B

June 21, 2010

Be concise, short, and to the technical point in your answers. Otherwise, you will be unable to answer all questions in time.

1. What material did you **mainly** use to prepare for the quiz? Pick only one; any selection will get you full points. *[2p]*

   ☐Printed book ☐Electronic book ☐Own notes on slides ☐Abstain

2. Why does the best fit-policy for placing memory allocations perform worse overall than for example the next-fit policy? *[4p]*

3. Two parents and their three children are standing in front of a cookie dispenser. The parents feed the machine with one cent coins. The machine uses the coins to make cookies, and dispenses them once the deposited amount exceeds three cents. The children continuously stare at the cookie machine and whenever it sees a cookie, and then they will grab and eat it.

   Available functions include: Parents use PrepareCoin() to prepare the next coin to be inserted and InsertCoin() to deposit a one cent coin in the machine. The machine uses PrepareCookie() to bake the next cookie and DispenseCookie() to dispense the baked cookie. The kids use GrabCookie() to take the dispensed cookie and EatCookie() to eat the taken cookie. Assume that the usual functions mentioned in the book such as parbegin(...) are available. Assume that PrepareCoin() takes a random amount of time, often much longer than all the other functions. The cookie machine accepts new coins as it produces the cookie (i.e., parent can execute InsertCoin() while the machine executes DispenseCookie()).

   - Find the errors in the program and explain each error in your text; also suggest a fix in your text. Refer to the line numbers when explaining something. *[10p]*
   - Explain the purpose of *m1*, *m2*, *C*, *R* in the context of this program. *[6p]*
   - Explain what type of semaphores (e.g., binary) and what mechanism of message passing (e.g., blocking) is necessary to correctly execute the example. *[6p]*

```
5  mailbox m1, m2;
6  semaphore C, R;
7  message msg;
8
9  Parent() {
10   while (true) {
11       PrepareCoin();
12       receive(m1,msg);
13       InsertCoin();
14       semsignal(C);
15       send(m1,msg);
16     }
17 }
18
19 Machine()  {
20   while (true) {
21       PrepareCookie();
22       semwait(C);
23       DispenseCookie();
24       semsignal(R);
25     }
26 }
27
28 Kid() {
29   while (true) {
30       semwait(R);
31       receive(m2,msg);
32       GrabCookie();
33       send(m1,msg);
34       EatCookie();
35     }
36 }
37
38 Main() {
39   send(m1, NULL);
40   send(m2, NULL);
41   C = -1;
42   R = 2;
43   parbegin(Parent, Parent, Machine, Kid, Kid, Kid)
44 }
```

End of quiz. Total points: 28

B

Quiz guide: The exam consists of 3 questions. The exam's total number of points is listed at the end. The quiz duration is 16 minutes. Note make sure you don't have the same quiz ID as any of your neighbours. If you have, say so immediately. **If you don't, you will invalidate your score.**