Course ECE354 Real-time Operating Systems

Quiz 2A

Jun 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. What is a zombie process? *[4p]*

3. Consider a system with the four robots A, B, C, and D: Two robots, A and B, produce bricks and stack them in front of them. There are two stacks S1 and S2 of size 5 and 3, respectively. Obviously only one robot can operate on one stack at a time. Nonetheless, robots A and B operate on the stacks S1 and S2 in a round-robin fashion (i.e. S1, S2, S1, S2, ...). Two robots, C and D, consume bricks from the stack. Robot C consumes only from S1 while robot D consumes only from S2.

   Available functions for handling bricks: produce() produces a new brick, put(stackid) puts the produced brick onto the stack *stackid*, consume() uses a brick, get(stackid) gets a brick from the stack *stackid*. Assume that the usual functions mentioned in the book such as parbegin(. . .) are available.

   - 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 *s1*, *s2*, *s3*, *s4*, *mayaccess1*, *mayaccess2* 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  extern stack S1,S2;
6  mailbox mayaccess1, mayaccess2;
7  message msg;
8  semaphore s1, s2, s3, s4;
9  Robot_AB () {
10   while (true} {
11       produce();
12       semwait(s1);
13       receive(mayaccess1,msg);
14       put(S1);
15       send(mayaccess1,NULL);
16       semsignal(s3);
17       produce();
18       semwait(s2);
19       receive(mayaccess2,msg);
20       grab(S2);
21       send(mayaccess2,NULL);
22       semsignal(s4);
23     }
24 }
25 Robot_C () {
26   while (true) {
27       semwait(s3);
28       receive(mayaccess1,msg);
29       put(S1);
30       send(mayaccess1,NULL);
31       semsignal(s1);
32       consume();
33     }
34 }
35 Robot_D () {
36   while (true) {
37       semwait(s4);
38       receive(mayaccess2,msg);
39       grab(S2);
40       send(mayaccess2,NULL);
41       semsignal(s1);
42       consume();
43     }
44 }
45 main () {
46   sendmessage(mayaccess1,NULL);
47   sendmessage(mayaccess2,NULL);
48   s1 = 5; s2 = 4; s3 = 1; s4 = 1;
49   parbegin(Robot_AB,Robot_AB,Robot_C,Robot_D);
50 }
```

End of quiz. Total points: 28

A

Quiz guide: The exam consists of 3 questions. The exam's total number of points is listed at the end. The quiz duration is 16minutes. 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.**