

2002 Paper 5 Question 4

Concurrent Systems and Applications

- (a) The `suspend()` and `resume()` methods defined on `java.lang.Thread` can be used to block and unblock a designated thread. Explain why these methods should not be used. [4 marks]
- (b) Define a Java class `Barrier` that pairs together two different kinds of thread (A and B) in a concurrent system. It should support two methods, `enterA(Object o)` and `enterB(Object o)`. A call to one `enter` method blocks until a call is made to the other. At that point both invocations continue, `enterA` returning the value passed to `enterB` and *vice versa*. [8 marks]
- (c) A number of barbers and customers have to co-ordinate their actions in a barbers' shop. Each barber has a chair in which a customer sits while receiving a haircut and in which that barber dozes when he has no customer. There is plenty of waiting space.

Define Java classes `Barber`, `Customer` and `Shop` to model this situation. The class `Customer` should support two methods:

- (i) `Barber getHaircut(Shop s)` – request service at `s`, blocking until the customer is served and returning the allocated barber;
- (ii) `void leaveChair(Barber b)` – signal that `b` can take another customer.

The class `Barber` should support two corresponding methods:

- (i) `Customer getCustomer(Shop s)` – wait to be allocated a customer at `s`;
- (ii) `void finishedCustomer(Customer c)` – signal to `c` that the haircut is finished and wait for `c` to leave the chair.

[8 marks]