1998 Paper 4 Question 3

Programming in Java

Describe briefly the facilities provided in Java for synchronising concurrent threads. [6 marks]

An alternative scheme would be to model the system used in some shops where a machine issues numbered tickets to customers, and customers are served in numeric order. A ticket machine holds an integer, initially zero, and has a single atomic operation:

`turn()`	increments the integer and returns its previous value

A scheduler also holds an integer, initially zero, and has two atomic operations:

`next()`	increments the integer count
`queue(value)`	suspends the calling thread until the count is at least as large as the value given as an argument

Given a ticket machine, `m`, and a scheduler, `s`, a critical region could then be coded as follows:

```
number = m.turn();
s.queue(number);
    .
    .       protected code
    .
s.next();
```

Write Java classes `TicketMachine`, with a `turn` method, and `Scheduler`, with `next` and `queue` methods. [8 marks]

Show how a synchronised buffer holding a single value could be implemented using this new scheme. [6 marks]