

2002 Paper 11 Question 2

Foundations of Programming

Four of the many facilities provided in Java for writing threaded code are the methods `start()`, `run()`, `wait()` and `notifyAll()`. Which of these is inherited from class `Thread`? From where are the others inherited? [4 marks]

The following class illustrates a single-value buffer.

```
class Buffer
{ private int value;
  private boolean full = false;

  public synchronized void put(int i) throws InterruptedException
  { while (this.full)
    { this.wait();
      this.value = i;
      this.full = true;
      this.notifyAll();
    }

  public synchronized int get() throws InterruptedException
  { while (!this.full)
    { this.wait();
      this.full = false;
      this.notifyAll();
      return this.value;
    }
  }
}
```

It is assumed that two threads are running, one of which incorporates a loop which puts a succession of values into the buffer via the method `put()` and the other of which incorporates a loop which gets a succession of values out of the buffer via the method `get()`.

Describe the first few times round the loops of each thread in a typical run. Your account should refer to the features of Java which enable the threads to operate satisfactorily and should distinguish between the terms *blocked on synchronized* and *blocked on wait*. [9 marks]

Write a test program which incorporates two threads that exercise class `Buffer` by calling `put()` and `get()` respectively. There is no need to copy out class `Buffer` itself. [7 marks]