1999 Paper 11 Question 3

Further Java

Describe the facilities in Java for restricting concurrent access to critical regions. Explain how shared data can be protected through the use of objects. [8 marks]

The built-in facilities for restricting concurrency in Java allow only one thread at a time to be executing within the critical region. A different approach is to distinguish *shared* and *exclusive* access to a critical region: any number of *readers* may share access at the same time, but only one *writer* may acquire exclusive access (excluding any readers while it does so).

Specify a `MultiSync` class in Java with methods to acquire and release both read and write access, and sketch its implementation. [6 marks]

Derive a `MultiBuffer` class that extends `MultiSync` with methods to store and read a data field, ensuring that any locks are released when a waiting thread is interrupted. Your example may use a simple data field such as an integer but you should explain why such an elaborate scheme of concurrency control is unnecessary in this case. [6 marks]