

## 2004 Paper 6 Question 4

### Concurrent Systems and Applications

- (a) A transaction processing system is using a *write-ahead log* as a mechanism for providing persistent storage. What information must be written to the log
- (i) when a transaction starts;
  - (ii) when a transaction performs an operation on a persistent object;
  - (iii) when a transaction commits? [2 marks each]
- (b) Describe how the log can be used to roll-back a transaction that has aborted or become deadlocked. [6 marks]
- (c) The log can also be used to recover after some kinds of system failure.
- (i) Describe how the log can be used to recover after a *fail-stop* crash. [2 marks]
  - (ii) What is meant by *checkpointing*? How will using it affect the structure of the log and the recovery procedure after a crash? [6 marks]