

2009 Paper 3 Question 3

Concurrent Systems and Applications

- (a) Define the ACID properties of transactions. [4 marks]
- (b) In the context of transactions, what does it mean to say that an execution schedule is *serialisable*? [1 mark]
- (c) Transaction systems can enforce either *strict* or *non-strict* isolation.
- (i) What is the difference between the two? [1 mark]
- (ii) Why do many systems enforce only non-strict isolation? [1 mark]
- (iii) When using non-strict isolation, executing transactions may experience *lost updates*, *dirty reads* or *unrepeatable reads*. For *each* of these, describe with the aid of an example what it means. [1 mark each]
- (d) Compare and contrast *two-phase locking* (2PL) and *optimistic concurrency control* (OCC) as means of providing isolation. You should discuss the level of isolation achieved, the degree of concurrent execution enabled, the behaviour in case of aborts, and the likely performance in the presence of contention. [10 marks]