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]