Concurrent Systems and Applications

(a) Transactions provide a means of grouping together a collection of separate operations to form a single logical operation. Explain the difference between implementations that enforce strict isolation and non-strict isolation. What are dirty reads and cascading aborts? [8 marks]

(b) Optimistic Concurrency Control (OCC) is a mechanism used to enforce isolation of transactions.

(i) Explain the OCC algorithm. [4 marks]

(ii) Is deadlock possible? Are cascading aborts possible? [2 marks]

(iii) Under what circumstances might this mechanism yield poor performance? [1 mark]

(c) Explain how to use a write-ahead log to provide persistence by detailing what information must be written to the log and how it can be used to recover from a fail-stop catastrophe. What are checkpoints and why are they useful? [5 marks]