8 Concurrent and Distributed Systems (SMH)

(*a*) In the context of concurrent systems, what is a *transaction*? [1 mark]

(*b*) Describe the ACID properties of transactions. [4 marks]

(*c*) Compare and contrast *strict* and *non-strict* isolation. [2 marks]

(*d*) For each of the following, describe how it can be used to provide isolation and/or strict isolation:

(*i*) 2-Phase Locking (2PL) [3 marks]

(*ii*) Time-Stamp Ordering (TSO) [3 marks]

(*iii*) Optimistic Concurrency Control (OCC) [3 marks]

(*e*) A researcher suggests an isolation scheme that works as follows:

(*i*) Every object o has an associated version number, $V(o)$.

(*ii*) When executing, a transaction reads a copy of any object it wishes to access, and remembers the version number.

(*iii*) If the transaction wishes to modify an object, it modifies the copy rather than the original.

(*iv*) When complete, the transaction checks the versions of all objects it has modified; if any are different, it aborts; otherwise it writes back the new versions of all objects, incrementing their version numbers, and commits.

Assuming that step (*iv*) occurs atomically, does this scheme ensure serializability? Justify your answer. [4 marks]