



4.10.5 Client Server Database

1) Staff at different surgeries access a database using a client-server database.

a) Describe a problem that could occur if concurrent access to a database was not controlled.

[3 marks]

- Two users edit a record simultaneously
- One user writes the record and then the other user writes on the same record
- One user's update is lost

b) Two methods that can be used to manage concurrent access are:

- Record locks
- Timestamp ordering

Select **one** of these methods and describe how it manages concurrent access.

[2 marks]

Record locks

- When a transaction on a record starts, a lock is set on the record
- Other transactions cannot edit the record until the lock is released

Timestamp ordering

- Timestamps are generated for each transaction
- Database records timestamp of the last read / write for each record
- Database server applies rules to determine if processing a transaction will result in loss of data integrity





- 2) A database system can be accessed by many users simultaneously.

Describe how timestamp ordering can be used to manage concurrent access to a database.

[3 marks]

- Timestamps are generated for each transaction // timestamps indicate the order that transactions occurred
 - Database records timestamp of last read / last write transaction for each record / data item
 - The database checks the timestamps to determine whether allowing the transaction would cause a conflict; if so, the transaction is aborted
 - Accept. Examples of rules for third mark point:
 - if a transaction tries to write to a record / data item, then the transaction should be aborted if the read/write timestamp on the record / data item is greater than the time at which the transaction started
 - if a transaction tries to read a record / data item, then the transaction should be aborted if the write timestamp on the record / data item is greater than the time at which the transaction started.
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- 3) It is possible that two users might try to access or update the system at the same time.

Explain the conditions under which simultaneous access to a database could cause a problem, and explain how serialisation can manage concurrent access to a database.

[3 marks]

Problem Conditions (1 mark):

- When two users try to update the same record simultaneously;

How dealt with (2 marks):

- Transaction Queuing
 - Updates / database changes are (grouped as transactions and) queued
 - Database software processes transactions in FIFO order from queue
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