**Transaction Locking Questions**

1. Some businesses will experience locking issues. A choice could be to make all updates run during a nightly batch cycle to alleviate locking issues in the daytime when users (customers) are using the system. Would batch processing be a good alternative for an online business, such as Amazon? Why or why not? (20)

This would not work since a business like Amazon doesn’t really have a “closing time” where customers are not using their system. I know that I have made orders on their site in the middle of the night. Amazon needs their data to be accessible and current at all times.

2. What is the difference between a shared lock and an exclusive lock? (10)

If a transaction has a shared lock on an item, it can read the item but not update it. If a transaction has an exclusive lock on an item, it can both read and update the item.

3. You use the ATM machine to withdraw money from your checking account. What set of steps does the DBMS need to perform in order for you to complete your transaction? (20)

The DBMS reads the data from the database and locks the record.

I request a withdrawl from the ATM.

The ATM distributes the cash to me.

The DBMS updates the database with the change.

The ATM gives a receipt with updated balance.

The DBMS unlocks the record now allowing other access (the bank or me again).

4. For credit card processing, stock exchanges, and airline reservations, data availability must be continuous. There are many other examples of mission-critical applications. Research the Internet to find two additional mission-critical applications and explain why data availability must be continuous for these applications. (25)

Two other applications that would need continuous access to data are hospitals and online shopping. For the health field, an ER would need to have access to a patient’s health records, other health facilites, or doctors at all times. A lapse in data availability may cause serious consequences. For online shopping, a company like Amazon would suffer greatly if their was an interruption in their data availability, especially around Christmas shopping season or a special sale event like Amazon Prime Day.

5. Locking is a "normal" database activity. It is the mechanism which mediates the concurrent access of a given resource by several "competing" processes. However, as a DBA you will come to recognize certain locking behavior that is an immediate tell-tale sign of something being intrinsically wrong.

Some common **lock types** are:

* RID – single row lock
* KEY – a range of keys in an index
* PAG – data or index page lock
* EXT – Extent Lock
* TAB – Table Lock
* DB – Database Lock

In addition to lock types that refer to resources or objects that can be locked, some databases such as SQL Server have common **lock modes**:

* S – Shared lock
* U – Update Lock
* X – Exclusive lock
* IS – Intent shared
* IU – Intent Update
* IX – Intent Exclusive
* BU – Bulk update

Discuss each **lock mode**: it’s intent/use, as well as, when and why it might be used. (25)

Shared – used for read operations that do not change or update data such as a select statement. No other transaction can modify data while a shared lock exists on the resource.

Update – used on resources that can be updated. Prevents a common form of deadlock that occurs when multiple sessions are reading, locking, and potentially updating the resources later.

Exclusive – used for data-modification operations, such as insert, update, or delete. Ensures that multiple updates cannot be made to the same resource at the same time. This lock type, when imposed, will ensure that a page or row will be reserved *exclusively* for the transaction that imposed the shared lock, as long as the transaction holds the lock.

Intent shared – protects requested or acquired shared locks on some (but not all) resources lower in the hierarchy.

Intent update – protects requested or acquired update locks on all resources lower in the hierarchy. IU locks are used only on page resources. IU locks are converted to IX locks if an update operation takes place.

Intent exclusive - protects requested or acquired shared locks on some (but not all) resources lower in the hierarchy. IX is a superset of IS, and it also protects requesting shared locks on lower level resources.

Bulk update - Used when bulk copying data into a table and the **TABLOCK** hint is specified. Bulk update (BU) locks allow multiple threads to bulk load data concurrently into the same table while preventing other processes that are not bulk loading data from accessing the table.