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Assignment 3

1. Ans:
    a. It can be done using 2 ways, individual and paired.
        i. Pair of (a,b) where a is the key value to search and b is the ID.
        ii. Pair of (a,b) where a is the key value to search and b is a list of associated IDs.
        iii. Search item (a) and "a*" is the record stored.

    b. The main differences are:
        i. There is a main cluster but there can be many unclustered indexes.
        ii. The main data is represented by an index in the clustered index. The index of unclustered index only represents data copy.
        iii. Pointer to data block is stored in the clustered index. But in the unclustered index, both pointer and value are stored.
        iv. It can be clustered and unclustered.
    c. Only one can be created to avoid replication and redundancy, avoiding them is also more beneficial.

2. Ans:
    a. Seek time is the time taken by the hard disc controller to locate a specific piece of information. It can be measured by (Track to track, Full stroke)
    b. Rotational delay/rotational latency is the time required for the addressed area of a computer's disk drive (or drum) to rotate into a position where it is accessible by the read/write head, associated with seek time and transfer time.

    c. Transfer time is the speed at which data is transferred to and from the disk media, measured in Bytes per second i.e. (MBps, GBps)

3. When the number of buffer frames is less than the pages in file, this will result in reading every page of the file. Caused by LRU and repeated scans when there are more frames than pages.

4. Ans:
    a. Fixed-length records have a fixed size for each record, which means that each record has the same number of fields with a fixed length.
    b. Variable-length records, on the other hand, have a flexible size for each record, which means that each record can have a different number of fields with varying lengths. Each record may have a header that specifies the length of the record and the location of each field within the record.
    c. If space is not a concern and quick access is important, fixed-length records may be the better choice. If space is a concern and flexibility is important, variable-length records may be the better choice.

5. Because a count can indicate the number of users that are currently accessing the frame, which is useful for managing concurrency and ensuring that a frame is not removed from the buffer pool until all users have finished using it. A simple flag cannot provide this level of information.

6. Ans:
   a. No read up: lower security level (i.e., lower clearance) cannot read data at a higher security level (i.e., higher clearance). This means that a subject with a security clearance of "confidential" cannot read data classified as "top secret". The reason for this rule is to prevent unauthorized subjects from accessing sensitive information that they are not authorized to view.
   b. No write down: a subject with a higher security level (i.e., higher clearance) cannot write data to a lower security level (i.e., lower clearance). This means that a subject with a security clearance of "top secret" cannot modify data classified as "confidential". The reason for this rule is to prevent the unauthorized modification of sensitive information by higher clearance subjects, which could result in the release of sensitive information.

7. Scenario: Healthcare center records.
   In a healthcare environment where patient records contain sensitive information such as medical history, diagnosis, and treatment. Mandatory access controls can prevent unauthorized access to patient records by enforcing access restrictions based on the role and clearance level of the user, even if discretionary controls are bypassed or misused.