# **CUU 1102:FUNDAMENTALS OF COMPUTER SYSTEMS:**

**ASSNGMENT TWO GROUP G**

**GROUP G MEMBERS**

1. IMRAN ABDISALAN 24/07984

**QUESTIONS**

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# Indexed File Organization Method

The indexed file organization method in both databases and file systems is a technique that efficiently stores, retrieves, and manages data. A copy of the index file is maintained which consists of the list of keys and their respective addresses that are kept in the main data file. This index serves to locate the position by providing a 'table of contents' or 'lookup table' with which particular data needed can be found in the minimum time possible without having to scan the whole datasets.

## Key Components:

1. An index file consists of pairs of key-value where the key is useful for searching purposes, and the value or pointer shows the actual location, for example address of the record in the primary data file.  
2. Main Data File: Contains the records themselves. The data is often maintained in an unsorted or logical order, but an exhaustive search is not needed due to the index.  
3. Indexed Fields: Some fields from the data file are chosen to be used as indexes, such as customer ID, product name, or any other field that is commonly used for searching.

## How it Works:

• When a request is made for the record, the system searches the index first.  
An index tells about the exact location (address) of the concerned record in the main data file.  
It then pulls the record directly from that address, and the search is much faster.

## Advantages of Indexed File Organization Method:

**(a) **Fast Access to Data**:**  
A significant benefit of the indexed file organization approach lies in its capacity to efficiently identify and access data. Given that an index functions as a reference tool or "table of contents," it enables the system to directly reach the precise location of the data without looking for a comprehensive search through the entire data file. This functionality is particularly advantageous in extensive datasets, where a record-by-record search would prove to be tiresome.This speeds up the process a great deal where there is regular access to specific information, such as customer data.

(b) **Efficient Searching**:

Indexed file organization reduces search time because the index ensures that the system operates only on the part of the data relevant to the search. For instance, given a database with millions of records, if the program searches based on customer ID, it finds the record nearly instantly instead of having to check every record.

(c) **Support for Range Queries**:  
Indexed file organization provides easy processing of range queries. Range queries are those questions that want records between a range of values. To understand this better, consider the retrieval of all customers who bought products between two dates or all products whose prices lie between 10 shillings and 20 shillings. Records needed for the index in such a query are retrieved without going through the whole data set. This is extremely useful in situations such as reporting or generating statistics where a large number of records over a range need to be accessed.

**(d) Reduced Input/Output Operations**:  
The index allows the system to directly place itself on the data, which reduces I/O operations. Since large databases constantly access disk storage, these reduced Input/Output operations become vital for bringing greater improvements in the performance of a system. The fewer the number of I/O operations required, the faster and more responsive the system is.

**(e) Flexibility with Multiple Indexes**:  
Indexed file organization allows for the development of multiple indexes for different fields in the data file. For example, a database might have separate indexes for customer IDs, product names, and order dates. This allows flexibility whereby users can search the data based on different fields depending on their needs.

**(f) Scalability for Large Datasets**:  
Unlike other methods that can slow down when more records are added, indexes can be organized and expanded to deal with more data. In cases where the index gets too big, for instance, a multi-level indexing can be allowed such that the accessing of data can even be faster by dividing the index into different levels. This aspect of growth makes indexed file organization good to be used for large and changing databases.

## Disadvantages: