



**Biyani Institute of Science & Management**  
**I Internal Examination 2019-20**  
**Class: MCA (III Semester)**  
**Subject- Advanced Database System Solution (MCA-304)**



Time: 1½Hrs

Set: A

MM: 20

**[I] Answer the following questions in one line only**

**(2 \* 1=2)**

1. What are object database systems?

Ans: It maintains a direct correspondence between real world and database objects so that objects do not lose their integrity and identity. An OODB can extend the existence of objects so that are stored permanently.

2. What is functional dependency?

Ans: A functional dependency (FD) is a relationship between two attributes, typically between the PK and other non-key attributes within a table.

**[II] Answer the following questions in 50 words**

**(2\*3=6)**

1. Define Homogeneous and heterogeneous DDBMS.

Ans: Two types of distributed databases are most commonly used:

- Homogeneous DDBS
- Heterogeneous DDBS

**1.Homogeneous DDBS :**

It is the simplest form of distributed database where are several sites, each running their own applications on the same DBMS software. All sites have identical DBMS software, all users(or clients) use identical software, are aware of one another and agree to cooperate in processing user's request.The application can all see the same schema and run the same transactions. That is is, there location transparency in homogeneous DDBS. The provision of location transparency forms the core of distributed database management system (DDBMS) development.

**2.Heterogeneous DDBS**

In heterogeneous database system, different sites run under the control of different DBMSs, essentially autonomously and are connected somehow to enable access to data from multiple sites. Different sites may use different schemas and different DBMS software. The sites may not be aware of one another and they may provide only limited facilities for cooperation in transaction processing. In other words, in heterogeneous DDBS, each server(site) is an independent and autonomous centralized DBMS that has its own local users, local transactions, and database administrator(DBA).

2. **Explain the concept of fragmentation.**

Ans: Technique of breaking up the database into logical units, which may be assigned for storage at the various sites, is called fragmentation. In the data fragmentation, a relation can

be partitioned (or fragmented) into several fragments(pieces) for physical storage purpose and there may be several replicas to each fragment. These fragments contain sufficient information to allow reconstruction of the original relation. All fragments of a given relation will be independent.

### **Horizontal Fragmentation:**

A horizontal fragment of a relation is subset of the tuples (rows) with all attributes in that relation. Horizontal fragmentation splits the relation ‘horizontally’ by assigning each tuple or group (subset) of tuples of a relation to one or more fragments, where each tuple or a subset has a certain logical meaning. These fragments can then be assigned to different sites in the distributed system, A horizontal fragmentation is produced by specifying a predicate that performs a restriction on the tuples in the relation. It is defined using the SELECT operation of the relational algebra.

### **Vertical Fragmentation**

Vertical fragmentation splits the relation decomposing ‘vertically’ by columns(attributes). A vertical fragment of a relation keeps only certain attributes of the relation at a particular site, because each site may not need all the attributes of a relation. Thus, vertical fragmentation groups together the attributes in a relation that are used jointly by the important transactions.

### **Mixed Fragmentation:**

Sometimes, horizontal or vertical fragmentation of database schema by itself is insufficient to adequately distribute the data for some applications. Instead, mixed or hybrid fragmentation is required. Thus, horizontal (or vertical) fragmentation of a relation, followed by further vertical (or horizontal) fragmentation of some of the fragments, is called mixed fragmentation. A mixed fragmentation is defined using the selection(SELECT) and projection (PROJECT) operations of the relational algebra. The original relation is obtained by a combination of JOIN and UNION operations.

**[III]Answer the following questions in 150 words.**

**(2 \* 6=12)**

1. Explain Architecture of distributed database with its components.

Ans: Following three architecture are used in distributed database systems.

- Client / server Architecture.
- Collaborating server system.
- Middleware system.

In all three architectures, Client Server is most popular.

### **Client / Server Architecture:**

Client / Server architecture are those in which a DBMS related workload is split into two logical components namely client and server, each of which typically executes on different systems. Client is the user of the resource whereas the server is a provider of the resource. Client/ server architecture has one or more client processes and one or more server process. The applications and tools are put on one or more client platforms (generally, personal computer or workstations) and are connected to database management system that resides on

the server (typically a large work station, midrange system, or a mainframe system) The applications and tools act as client of the DBMS, making request for its services. The DBMS, in turn, services these requests and returns the results to the client(s). A client process can send a query to any one server process. Clients are responsible for user interface issues and servers manage data and execute transaction.

### **Client/ server architecture consists of the following main components:**

- Clients in form of intelligent workstations as the user's contact point.
- DBMS server as common resources performing specialized task for devices requesting their services.
- Communication networks connecting the clients and the servers.
- Software applications connecting clients, servers and network to create a single logical architecture.

### **Benefits of Client / Server Database Architecture:**

- This architecture is relatively simple to implement, due to its clean separation of functionality and because the server is centralized.
- Better adaptability to the computing environment to meet the ever changing business needs of the organization.
- User of graphical user interface(GUI) on microcomputers by the user at client, improves functionality and simplicity.
- Architecture tends to be less expensive than alternative mini or mainframe solutions.
- Computing platform independence.
- Overall productivity improvement due to decentralized operations

### **Limitations of Clients / Server Database Architecture**

The client / server architecture does not allow a single query to span multiple servers because the client process would have to be capable of breaking such a query into appropriate sub queries to be executed at different sites and then putting together the answer to the sub queries.

The client process is quite complex and its capabilities begin to overlap with the server. This results in difficulty in distinguishing between clients and servers.

An increase in the number of users and processing sites create security problems.

2. What are the trade offs and benefit of using OODBMS over an ORDBMS? Explain.

Ans: Object oriented database management system(OODBMS) is the manager of an OODB. Many OODBMSs use a subset of the OODM features. Those who create the OODBMS tend to select the OO features that best serve the OODBMSs purpose such as support for early or late binding of the data types and methods and support for single or multiple inheritances. Several OODBMSs have been implemented in research and commercial applications.

## **Features of OODBMSs**

- Must support complex objects.
- Must support object identity.
- Must Support encapsulation.
- Must support types of classes.
- Type or classes must be able to inherit from their ancestors.
- Must support dynamic binding.
- The data manipulation language (DML) must be computationally complete.
- The set of the data types must be extensible.

## **General DBMS Features:**

- Data persistence must be provided, that means, must be able to remember data locations.
- Must be capable to managing very large database.
- Must support concurrent users.
- Must be capable of recovery from hardware and software failures.
- Data query must be simple.

## **Advantage of OODBMSs**

- Enrich modeling capabilities: It allows the real-world to be modeled more closely
- Reduced redundancy and increased extensibility: It allows new data types to be built from existing types. It has the ability to factor out common properties of several classes and from them into super classes that can be shared with subclasses.
- More expressive query language. It provides navigational access from one object to the next for data access in contrast to the associative access of SQL.