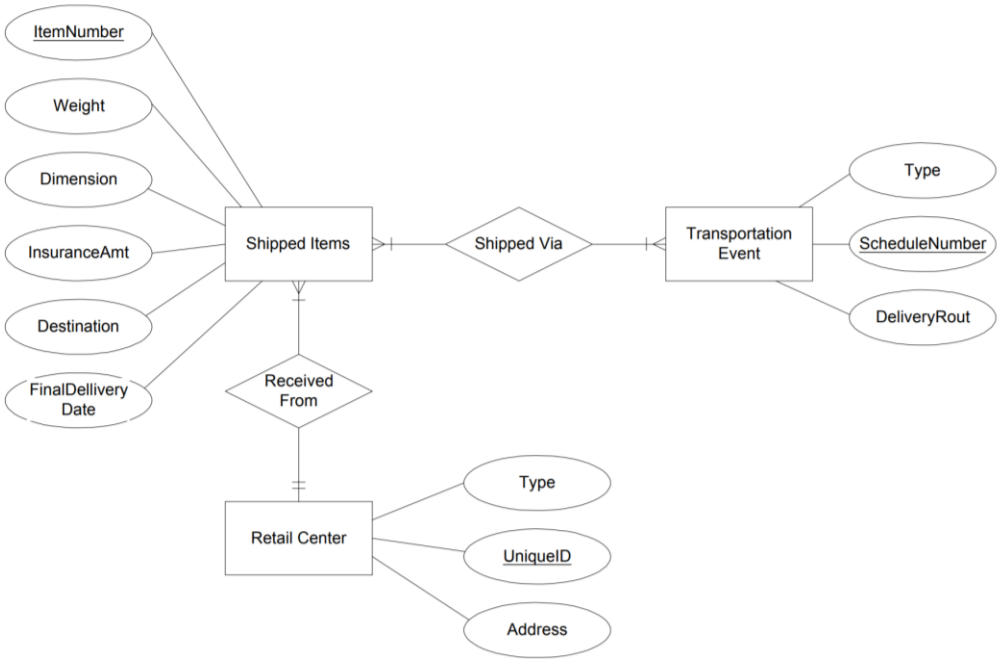
Database Management System(Application)

Summer-2022

Summer Exam-2022
Solutions – Database Management System (Application)

Q.1.



Total Marks 05

Q.2. (a) **Some of the major advantages of DBMS are as follows:** 04

- **Controlled Redundancy:** DBMS supports a mechanism to control the redundancy of data inside the database by integrating all the data into a single database and as data is stored at only one place, the duplicity of data does not happen.
- **Data Sharing:** Sharing of data among multiple users simultaneously can also be done in DBMS as the same database will be shared among all the users and by different application programs.
- **Backup and Recovery Facility:** DBMS minimizes the pain of creating the backup of data again and again by providing a feature of 'backup and recovery' which automatically creates the data backup and restores the data whenever required.
- **Enforcement of Integrity Constraints:** Integrity Constraints are very important to be enforced on the data so that the refined data after putting some constraints are stored in the database and this is followed by DBMS.
- **Independence of data:** It simply means that you can change the structure of the data without affecting the structure of any of the application programs.

Q.2. (b) **Relational Data Model :** 12

The relational data model was developed by E.F. Codd in 1970. There are no physical links as they are in the hierarchical data model. Following are the properties of the relational data model :

- Data is represented in the form of table only.
- It deals only with the data not with the physical structure.
- It provides information regarding metadata.
- At the intersection of row and column there will be only one value for the tuple.
- It provides a way to handle the queries with ease.

Hierarchical Data Model :

Hierarchical data model is the oldest type of the data model. It was developed by IBM in 1968. It organizes data in the tree-like structure. Hierarchical model consists of the the following :

- It contains nodes which are connected by branches.
- The topmost node is called the root node.
- If there are multiple nodes appear at the top level, then these can be called as root segments.
- Each node has exactly one parent.
- One parent may have many child.

Object Oriented Model:
Object oriented model is database model in which information is represented in the forms of objects and used in object oriented programming.

Q.2. (c) 04

- **Logical Data Model:** Defines **HOW** the system should be implemented regardless of the DBMS. This model is typically created by Data Architects and Business Analysts. The purpose is to developed technical map of rules and data structures.

- **Physical Data Model**: This Data Model describes **HOW** the system will be implemented using a specific DBMS system. This model is typically created by DBA and developers. The purpose is actual implementation of the database.

Total Marks 20

Q.3. (a) A single entry in a table is called a **Tuple** or **Record** or **Row**. A **tuple** in a table represents a set of related data. For example, the above **Employee** table has 4 tuples/records/rows. 04

ID	Name	Age	Salary
1	Adam	34	13000

Q.3. (b) An **aggregate function** performs a calculation on a set of values, and returns a single value. Except for COUNT(*), **aggregate functions** ignore null values. **Aggregate functions** are often used with the GROUP BY clause of the SELECT statement. 04

Q.3. (c) A data definition language (DDL) is used to define the database conceptual schema. In most DBMSs, the DDL also defines user views and, sometimes, storage structures; in other DBMSs, separate languages or functions exist for specifying storage structures 04

Q.3. (d) The SELECT clause of SQL specifies the attributes whose values are to be retrieved, which are called the projection attributes, and the WHERE clause specifies the Boolean condition that must be true for any retrieved tuple, which is known as the selection condition. The FROM clause specifies all relations (tables) needed in the query, including joined relations, but not those in nested queries. 04

Total Marks 12

Q.4. a The **macro life cycle** typically includes the following phases: 08

1. Feasibility analysis. This phase is concerned with analyzing potential application areas, identifying the economics of information gathering and dissemination, performing preliminary cost-benefit studies, determining the complexity of data and processes, and setting up priorities among applications.

2. Requirements collection and analysis. Detailed requirements are collected by interacting with potential users and user groups to identify their particular problems and needs. Inter-application dependencies, communication, and reporting procedures are identified.

3. Design. This phase has two aspects: the design of the database system and the design of the application systems (programs) that use and process the database through retrievals and updates.

4. Implementation. The information system is implemented, the database is loaded, and the database transactions are implemented and tested.

5. Validation and acceptance testing. The acceptability of the system in meeting users' requirements and performance criteria is validated. The system is tested against performance criteria and behavior specifications.

6. Deployment, operation, and maintenance. This may be preceded by conversion of users from an older system as well as by user training. The operational phase starts when all system functions are operational and have been validated. As new requirements or applications crop up, they pass through the previous phases until they are validated and incorporated into the system. Monitoring of system performance and system maintenance are important activities during the operational phase.

Activities related to the **micro life cycle**, which focuses on the database application system, include the following:

1. System definition. The scope of the database system, its users, and its applications are defined. The interfaces for various categories of users, the response time constraints, and storage and processing needs are identified.

2. Database design. A complete logical and physical design of the database system on the chosen DBMS is prepared.

3. Database implementation. This comprises the process of specifying the conceptual, external, and internal database definitions, creating the (empty) database files, and implementing the software applications.

4. Loading or data conversion. The database is populated either by loading the data directly or by converting existing files into the database system format.

5. Application conversion. Any software applications from a previous system are converted to the new system.

6. Testing and validation. The new system is tested and validated. Testing and validation of application programs can be a very involved process, and the techniques that are employed are usually covered in software engineering courses. There are automated tools that assist in this process, but a discussion is outside the scope of this textbook.

7. Operation. The database system and its applications are put into operation. Usually, the old and the new systems are operated in parallel for a period of time.

8. Monitoring and maintenance. During the operational phase, the system is constantly monitored and maintained. Growth and expansion can occur in both data content and software applications. Major modifications and reorganizations may be needed from time to time.

Q.4. b A sorted file (or sequential file) keeps the records ordered by the value of a particular field (called the sort key).A **sequential file** contains records **organized** by the order in which they were entered. The order of the records is fixed. Records in **sequential** files can be read or written only **sequentially**. After you place a record into a **sequential file**, you cannot shorten, lengthen, or delete the record. 06

In **cluster file organization**, two or more related tables/records are stored withing same **file** known as **clusters**. These files will have two or more tables in the same data block and the key attributes which are used to map these table together are stored only once.

Q.4. c RAID (Redundant Arrays of Inexpensive (or Independent) Disks)—a data storage system architecture that is commonly used in large organizations for better reliability and performance. 06

A RAID system consists of two or more drives working in parallel. These can be hard discs. There are different RAID levels, each optimized for a specific situation.

Q.4. d One technique for introducing redundancy is called mirroring or shadowing. Data is written redundantly to two identical physical disks that are treated as one logical disk. When data is read, it can be retrieved from the disk with shorter queuing, seek, and rotational delays. If a disk fails, the other disk is used until the first is repaired. 04

Disk mirroring also doubles the rate at which read requests are handled, since a read can go to either disk. The transfer rate of each read, however, remains the same as that for a single disk.

Pros: Fault tolerance and easy data recovery. Increased read performance.
Cons: Lower usable capacity. Higher cost per megabyte (double the amounts of drives is required to achieve desired capacity).

Total Marks 24

Q.5. Database designers are responsible for identifying the data to be stored in the database and for choosing appropriate structures to represent and store this data. These tasks are mostly undertaken before the database is actually implemented and populated with data. It is the responsibility of database designers to communicate with all prospective database users in order to understand their requirements and to create a design that meets these requirements. In many cases, the designers are on the staff of the DBA and may be assigned other staff responsibilities after the database design is completed. Database designers typically interact with each potential group of users and develop views of the database that meet the data and processing requirements of these groups. Each view is then analyzed and integrated with the views of other user groups. The final database design must be capable of supporting the requirements of all user groups.

Database Managers are primarily responsible for creating new databases or upgrading existing databases for large or small companies. They perform maintenance on databases, check data accessibility and troubleshoot problems with new systems as needed.

In any organization where many people use the same resources, there is a need for a chief administrator to oversee and manage these resources. In a database environment, the primary resource is the database itself, and the secondary resource is the DBMS and related software. Administering these resources is the responsibility of the database administrator (DBA). The DBA is responsible for authorizing access to the database, coordinating and monitoring its use, and acquiring software and hardware resources as needed. The DBA is accountable for problems such as security breaches and poor system response time. In large organizations, the DBA is assisted by a staff that carries out these functions.

Total Marks 08

Q.6. Anomalies that cause redundant work to be done during insertion into and modification of a relation, and that may cause accidental loss of information during a deletion from a relation. 06

Teacher_ID	Name	Department	Student_Group
123	Mr.X	Accounting	A
234	Mr.Y	Marketing	B
234	Mr. z	Marketing	C

A deletion anomaly is the unintended loss of data due to deletion of other data. For example, if the student group "A" disbanded and was deleted from the table above, Mr.X and the Accounting department would cease to exist. This results in database inconsistencies and is an example of how combining information that does not really belong together into one table can cause problems.

An insertion anomaly is the inability to add data to the database due to absence of other data. For example, assume Student_Group is defined so that null values are not allowed. If a new teacher is hired but not immediately assigned to a Student_Group then this teacher could not be entered into the database. This results in database inconsistencies due to omission.

Total Marks 06

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