

Pakistan Institute of Public Finance Accountants

Model Solutions

Database Management System AGP | PG | PUBLIC Sectors Winter Exam-2023

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- **Q.1.** From usage point of view, files can be divided into the following types:
- (a)

Master File

Master file is the main file in the file system. It is created to maintain (or to store) information that remains constant for a long period of time. For example, employees master file of an organization contains the records of all its employees. This file may contain the fields like 'Name', 'Address', 'Telephone Number' etc.

Master file is the latest updated file. It is updated when any change in its contents is required. In updating process, records can be edited (changed), deleted or new records can be added in a master file. Once a master file is created it cannot become empty.

Transaction File

A type of file that is used to store input data before processing is called *transaction file*. It may be a temporary file. It is usually used to update data in master file. The transaction file may exist until the master file is updated. A transaction file may also be used to maintain a permanent record of data about a transaction.

Q.1. Describe Program File and Data File in detail.

(b)

File Types from Functional Point of View

Different files perform different functions. A file can be recognized by its file extension. Different files may have different file extensions. Normally, the extension of a file is given by the software in which it is created. The name of file and its extension are separated by dot (.).

From functional point of view, files can be divided into two types:

- Program File
- Data File

Program File

A type of file that contains a set of instructions of program is called *program file*. It is an executable file. A program file has the file extensions .exe or .com.

Data File

A type of file that contains data is called *data file*. Data files are created by the software being used. Each program (or software) stores data into data file in its own format. Usually, a data file created into one application program cannot be used into another application program. For example, a file created in Microsoft Excel can only be used in it. However, some software or application programs provide facility to use the data files of different formats.

Data files are generally recognized by the file extension. For example, a file created in MS-Word has file extension 'doc', and is known as *document file*.

Total Marks 10



<u>Grading:</u> Entities correctly identified: Attributes correctly identified: Primary keys correctly identified: Relationships and cardinality correctly identified:

Q.2. Total Completeness Constraint

b Total Completeness Constraint exist only if we have a super type and some subtypes associated with that supertype, and the following situation exists between the super type and subtype.

All the instances of the supertype entity must be present in at one of the subtype entities, i.e. there should be not instance of the supertype entity which does not belong to any of the subtype entity.

Partial Completeness Constraint

This type of completeness constraint exists when it is not necessary for any supertype entity to have its entire instance set to be associated with any of the subtype entity.

This type of situation exists when we do not identify all subtype entities associated with a supertype entity, or ignore any subtype entity due to less importance of least usage in a specific scenario.

Total Marks 22

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- Q.3. A key is an attribute (field) or set of attributes of a relation. Keys are defined in the relations for the following purposes:
 - For uniquely identifying the records of a relation
 - For establishing relationships between relations
 - For quickly accessing particular records from the relation / table
 - For sorting records of a relation based on the data of one or more columns



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Q.3. TYPES OF KEYS

- (b) Different types of keys are as follows:
 - Primary key
 - Secondary key
 - Candidate key
 - Alternate key
 - Composite key
 - Sort key
 - Foreign key

Primary key

An attribute or a set of attributes that uniquely identifies each record (row) in a relation is known as *primary key*. In a relational database, each relation must have a primary key.

An attribute of a relation is selected as a primary key when its value for each record must be unique. For example, in "Employee" table of an organization that has attributes Emp_Code, Emp_Name, Emp_Salary, and Emp_DOB etc. Each employee has a unique code assigned by the organization. So the most suitable attribute of the "Employee" table for selecting primary key is "Empt_Code". It uniquely identifies each employee in the organization. On the other hand, the attribute "Emp_Name" is not unique. More than one employee may have same name. So, it cannot be used as primary key.

Please note the following points about primary key:

- A relation can have only one primary key.
- Each value in primary key must be unique.
- A Primary key can not have a null value.

Secondary key

An attribute or a set of attributes of a relation that is used to retrieve specific data from a relation is called *secondary key*. It is non-unique field.

For example, in a "Student" relation, the Class_ID field may contain the values "ICS", "Pre_Medical", "Pre_Engineering" or "Arts". In a "Student" relation, multiple records may have value "ICS" in Class_ID field and so on. So, this field can be used as seconday key. In this way, you can access all those records from "Student" table that have specific value in Class_ID field such as the value "ICS".

Candidate key

A relation may have more than one attribute that can be used as primary key. An attribute or set of attributes that can be used as primary key is called *candidate key*.

For example, "Student" relation may have attributes "Roll_No", "NIC", "Registration_No", "Address", and "Phone_No" etc. In "Student" relation, "Roll_No", "NIC", "Registration_No" are attributes that can uniquely identify the records of students. So, any one of these attributes can be used as primary key. Therefore, these attributes are known as *candidate keys*.

Alternate key

If one the suitable candidate key is selected as the primary key of the relation, then the other candidate keys are called the *alternate keys*.

Suppose "Student" relation may have candidate keys 'Roll_No', 'NIC' and 'Registration_No'. If "NIC" attribute is selected as primary key, then Roll_No and Registration_No will be the *alternate keys* of 'Student' relation.



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Composite key / Concatenate key

A key that consists of two or more attributes of a relation is *called composite* key. It is also referred to as *concatenate key*.

For example, a "Student" relation containing attributes, Roll_No, Class_ID, Name, Address and Phone_No. The attributes, Roll_No and Class_ID may be selected as composite key, so that the records of all the classes of a college can be uniquely identified.

Sort key / Control key

The records of a table are sorted based on the data of one or more fields. An attribute or set of attributes that is used to sort the records of a table in a specific order is called *sort key*. It is also known as *control key*. For example, records of "Student" table can be sorted based on "Name" attribute, "Marks" attribute or by selecting both "Name and "Marks" attributes as sort key etc.

Foreign key

A foreign key is an attribute or set of attributes in a table whose values must match a primary key in another table. The table that contains the foreign key is called *dependent table* or *child table*. Similarly, the table to which the foreign key refers is called the *parent table*.

The foreign key is used to establish relationship between two tables. The tables relationship may be one-to-one (1:1) or one-to-many (1:M). For example, Roll_No may be an attribute of "Result" table but not its primary key. However, it is the primary key of the "Student" table. In "Result" table, Roll_No is called foreign key.

Total Marks 12

Q.4. Entities

(a) Anything in the real world that has a set of different attributes or properties is known as *Entity*. An entity may be an object with a physical existence such as a person, a place etc. similarly, an entity may be an object with a conceptual existence such as university course, account, a job, an event etc. Some examples of entities are TEACHER, CLASS, STUDENT, CAR COMPUTER AND AETOPLANE.

In E-R diagram, a rectangular box is used to represent an entity. The name of entity in capital letters is written inside the rectangular box. For example, STUDENT and COMPUTER entities are represented as follows:

- STUDENT
- COMPUTER

Q.4. Database Administrator (DBA)

(b) The database administrator (DBA) performs very important role in DBMS environment. The DBA is responsible for designing, coordinating and monitoring the database system. The DBA is an IT professional. He must be technically competent having excellent communication and management skills. The management skills (such as plan and coordinate) have importance for the database development phases, and to supervise the staff. The technical skill is another most important factor because DBA has to implement the database system. He must be expert to install and operate complex hardware and to handle the hardware problems. He must also have the knowledge of general-purpose programming languages, database languages and to handle complex software.

The major duties of a DBA are;

- Installing and managing the DBMS.
- Coordinating and monitoring DBMS.
- Designing the structure of database.
- Allocating username and password to each user.
- Maintenance of the operational system.
- Creating backup of data regularly.
- Providing training to users for using and accessing database.

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Q.4. Data Administrator (DA)

(c) Data Administrator is a person who is responsible for the entire data resource of an organization. He develops functional requirements for the database being used in the organization. The main job of Data Administrator is to decide what data should be stored in the database. He / She also establishes policies for maintaining data, once it has been stored. Usually, Data Administrator is a manager of the organization and not an IT professional.

Normally, the data administrator serves as a bridge between users and the database administrator. His major duties may be the following:

- He shares in developing the logical design for each database.
- He establishes the data standards.
- He supervises the data distribution within the organization and communities with the users when necessary.
- He also participates in developing the data dictionary and prepare documentations.
- He conducts user training when needed.

Total Marks 18

Q.5. SQL statements are high-level instructions and each statement is responsible for a specific task. TheseO4 statements can generally be classified into five categories:

- Data Definition Language (DDL)
 - * This family of SQL commands is used to define database schema.
 - * Examples include CREATE , DROP, ALTER
- Data Manipulation Language (DML)
 - * This family of SQL commands is used to modify the data inside a table. * Examples include INSERT , UPDATE , DELETE
- Data Query Language (DQL)
 - * This family of SQL commands performs query on existing tables.
 - * Examples include SELECT
- Data Control Language (DCL)
 - * This family of SQL commands deals with the rights and permissions.
 - * Examples include GRANT, REVOKE

• Transaction Control Language (TCL)

- * This family of SQL commands deals with transactions.
- * Examples include COMMIT, ROLLBACK, SAVEPOINT
- * You only need these commands if you have OLTP operation.
- Q.5. Both of these functions return a single value, the difference is the input, scalar functions operate on a 04 single value while aggregate functions operate on a set of values. I try to clarify the difference with an example.

For example, string functions like ISNULL(), ISNUMERIC(), LEN() are scalar functions. They input a single value and return a single value. On the other hand, AVG(), MAX(), SUM() are aggregate functions, they input multiple values and output a single value.



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Q.6. From storage point of view, the files ae divided into the following types:

- Sequential files
- Direct or random files
- Indexed sequential files

Sequential files

In sequential data files, records are stored on the storage media in a sequence. No locations are specified for individual records. Records are stored in an order, one after the other. Similarly, records are also retrieved in sequential order. For example, to access a particular record from a data file, all records are searched one by one until the specified record is found. Therefore, accessing records in sequential files is very slow. It is the major disadvantage of sequential access.

Direct or random files

Direct files are also referred to as random files. In these files, records are not stored in a sequence. Each record is stored by specifying a particular address or location within a file. The address is calculated against the value of the key field of the record. Sometimes, the same address is calculated, which creates a problem to store record. This problem is known as *synonym*.

Data accessing from direct files is very fast. A record is accessed directly by specifying its address.

Indexed sequential files

Indexed Sequential files can be processed sequentially as well as randomly. In these files, the location of individual record is also stored along with data of record. For this purpose, an index is created to keep the track of locations of individual records.

Index refers to the location on the storage media where record is stored. The key fields of the records are stored separately into the index along with the address of each record. Usually, an index is created in a new file called *index file*. The index file is updated whenever a new record is added or an existing record is deleted.

Indexed file organization is more effective and fast in accessing data from data file than sequential file organization. These files occupy more space on the storage media but accessing speed of records is same as random access files.

Q.6. Backup File

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A type of file that is used to keep a copy of data is known as backup file. It is permanent file. It is used to take the backup of important data (It means to make the duplicate copy of data).

Backup files are mostly created for the protection of important data or files of an organization. The data can be recovered from backup files if any data file is lost or damaged. Backup files are created by using specific software (utility program).

Total Marks 10
