

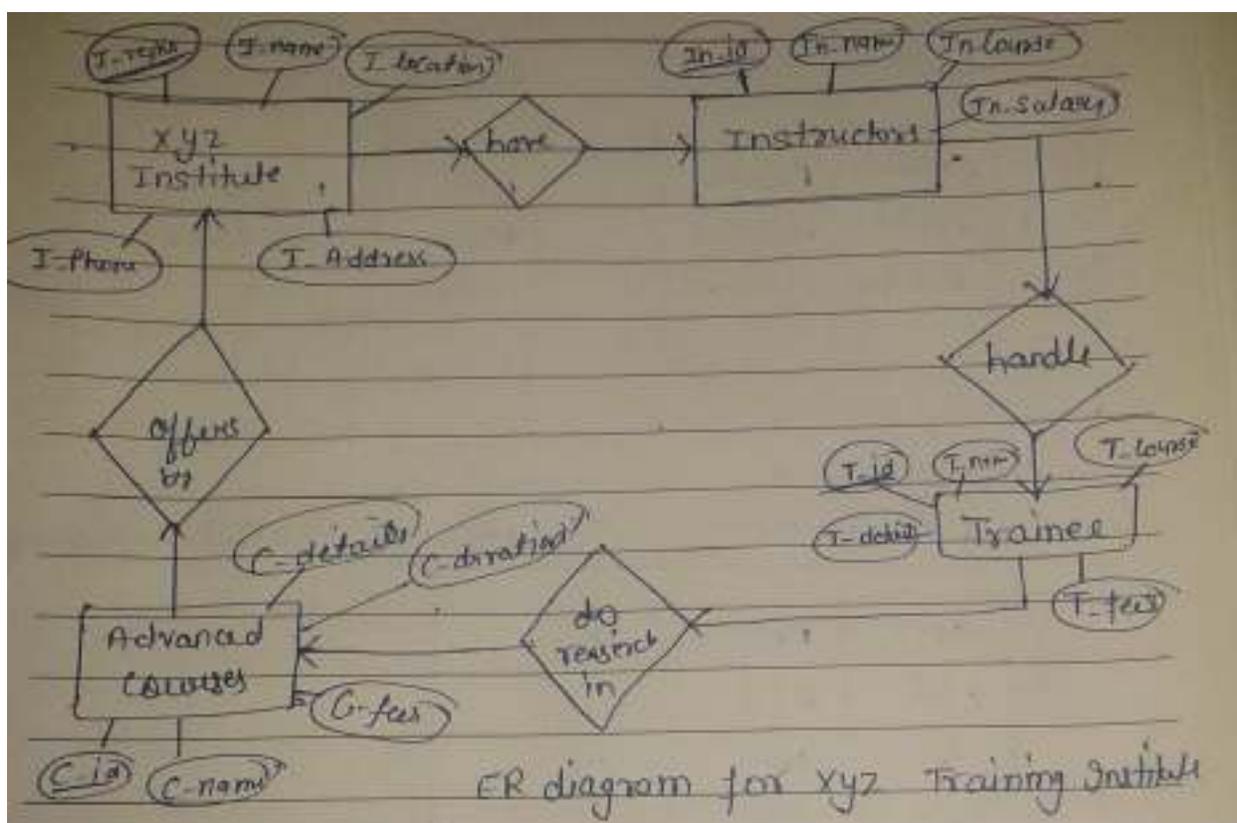
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ASSIGNMENT OF MCS-023 DBMS

Question 1:

Design an ER diagram for an XYZ Information Technology Training Institute that will meet the information needs for their training programmes. Clearly indicate the entities, relationships, cardinality and the key constraints. The description of the environment is as follows:



Question 2:

Staff No.	Branch No.	Branch Address	Name	Position	Hrs/Week
E101	B02	Sun Plaza, Delhi, 110001	Rahul	Assistant	16
E101	B04	2/3 UT, Delhi, 110111	Rahul	Assistant	9
E122	B02	Sun Plaza, Delhi, 110001	Medha	Assistant	14

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E122

B04

2/3 UT, Delhi, 110111

Medha Assistant

10

NORMALIZATION

Normalization is a systematic approach of decomposing tables to eliminate data redundancy and undesirable

characteristics like Insertion, Update and Deletion Anamolies. It is a two step process that puts data into tabular form by removing duplicated data from the relation tables.

Normalization is used for mainly two purpose,

- Eliminating reduntant(useless) data.
- Ensuring data dependencies make sense i.e data is logically stored.

Problem Without Normalization

Without Normalization, it becomes difficult to handle and update the database, without facing data loss.

Insertion, Updation and Deletion Anamolies are very frequent if Database is not Normalized.

Updation Anamoly : To update address of a student who occurs twice or more than twice in a table, we will have to update S_Address column in all the rows, else data will become inconsistent.

Insertion Anamoly : Suppose for a new admission, we have a Student id(S_id), name and address of astudent but if student has not opted for any subjects yet then we have to insert NULL there, leading to Insertion Anamoly.

Deletion Anamoly : If (S_id) 401 has only one subject and temporarily he drops it, when we delete that row, entire student record will be deleted along with it.

First Normal Form (1NF)

A row of data cannot contain repeating group of data i.e each column must have a unique value. Each row of data must have a unique identifier i.e Primary key. For example consider a table which is not in First normal form

Staff No.	Branch No.	Branch Address	Name	Position	Hrs/Week
E101	B02	Sun Plaza, Delhi, 110001	Rahul	Assistant	16
E101	B04	2/3 UT, Delhi, 110111	Rahul	Assistant	9

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E122	B02	Sun Plaza, Delhi, 110001	Medha Assistant	14
E122	B04	2/3 UT, Delhi, 110111	Medha Assistant	10

After 1st nf the table look like that because

- It have all unique records.
- And it have primary key.

Primary key

Sid	S-no	S-name	Position	Bno	B Address	Hrs
1	E101	Rahul	Assistant	B02	Sun Plaza	10
2	E101	Rahul	Assistant	B04	UT	9
3	E122	Medha	Assistant	B02	Sun Plaza	14
4	E122	Medha	Assistant	B04	UT	10

Second Normal Form (2NF)

A table to be normalized to Second Normal Form should meet all the needs of First Normal Form and there must not be any partial dependency of any column on primary key. It means that for a table that has concatenated primary key, each column in the table that is not part of the primary key must depend upon the entire concatenated key for its existence. If any column depends only on one part of the concatenated key, then the table fails Second normal form

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primary key, non key ← non key

Staff detail

SNO	Sname	Position
E101	Rahul	Assistant
E122	medha	Assistant

Branchdetail

Bno	Baddress
B02	Sun Plaza
B04	UT

SNO, BNO ← Hrs Partial dependency

Composite key

SNO	BNO	Hrs
E10	B02	16
E122	B02	14
E10	B04	9
E122	B04	10

Question 3:

Explain how the “GROUP By” clause works. What is the difference between the WHERE and HAVING clauses? Explain them with the help of an example for each.

Ans

The SQL GROUP BY clause can be used in an **SQL SELECT statement** to collect data across multiple records and group the results by one or more columns.

The syntax for the SQL GROUP BY clause is:

```
SELECT column1, column2, ... column_n, aggregate_function (expression)
FROM tables
WHERE predicates
GROUP BY column1, column2, ... column_n;
```

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Example

```
SELECT department, SUM(sales) as "Total sales"  
FROM order_details  
GROUP BY department;
```

WHERE

Using where clause we can restrict or filter the records that we get from select statement.

Let say from the select statement we are fetching 10 records but we wanted to display 3 records. In the below example we are trying to fetch only the employee records for deptno = 10.

```
SELECT cusnum, lstrnam, init  
FROM Test  
WHERE state IN ('CA', 'LA')
```

HAVING

Columns used in 'select' must be used with 'group by', otherwise system does not recognize it as a group by expression.

When SQL statement is run, data fetched from the database is grouped first based on deptno and then sum() function is applied to get the desired result.

Having clause is used to restrict the records that are grouped using group by clause.

Having clause is just like where clause but it can be used only with group by as we cannot use where clause in group by. Having clause works or can be used, only in the combination with group by clause.

```
SELECT state, SUM(baldue)  
FROM Test  
GROUP BY state  
HAVING SUM(baldue) > 0  
ORDER BY state
```

Question 4

Given the *relational schema*:

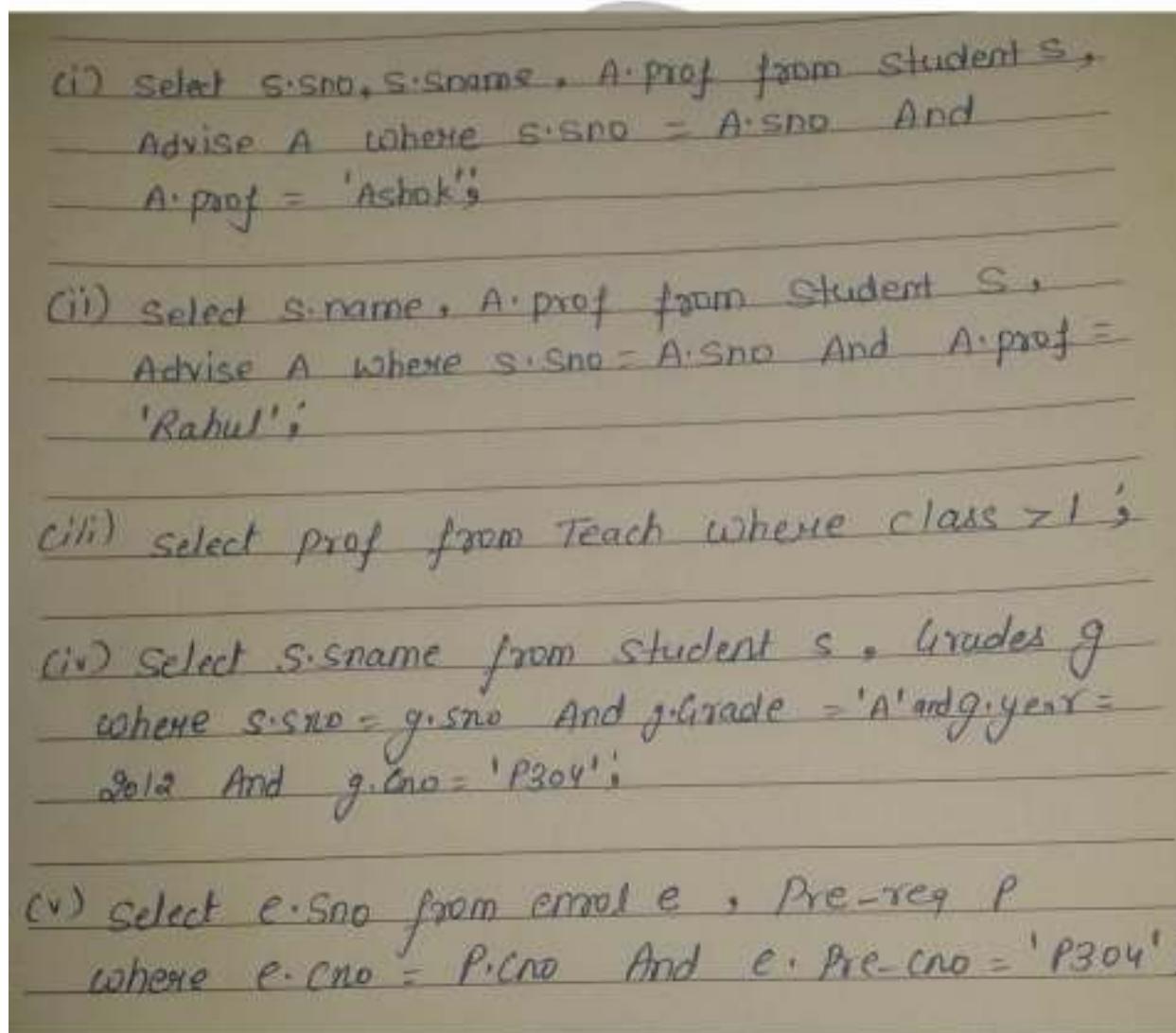
ENROL (S#, C#, Class) - S# represents student number
TEACH (Prof, C#, Class) - C# represents course number
ADVISE (Prof, S#) - Prof is project guide of S#
PRE_REQ (C#, Pre_C#) - Pre_C# is prerequisite course
GRADES (S#, C#, Grade, Year)
STUDENT (S#, Sname) - Sname is student name

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Give queries expressed in relational algebra, tuple calculus and domain calculus for the following:

- (i) List all students taking courses with Prof Ashok.
- (ii) List all student names who have selected Prof Rahul as project Guide.
- (iii) List those professors who teach more than one class.
- (iv) List all the student names who got Grade A in the year 2012 in C# P202.
- (v) List all the students who has taken the pre-requisite course Pre_C# P304.



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Question 5:

What are the advantages of indexed-sequential file organisation? With the help of an example explain the structure of indexed-sequential file.

Ans-

Advantages of indexed-sequential file organization

- It organises the file like a large dictionary, i.e., records are stored in order of the key but an index is kept which also permits a type of direct access.
- The records are stored sequentially by primary key values and there is an index built over the primary key field.
- The retrieval of a record from a sequential file, on average, requires access to half the records in the file, making such inquiries not only inefficient but very time consuming for large files.
- To improve the query response time of a sequential file, a type of indexing technique can be added.
- An index is a mechanism for faster search. Although the indices and the data blocks are kept together physically, they are logically distinct. An index can be small enough to be read into the main memory

	Enrolment Number	Name	City	Programme
BLOCK 1	2109348	ANU VERMA	CHENNAI	CIC
	2109349	ABHISHEK KUMAR	CALCUTTA	MCA
	2109351	VIMAL KISHOR	KOCHI	BCA
	2109352	RANJEETA JULIE	KOCHI	CIC
BLOCK 2	2109353	MISS RAJTYA BANU	VARANASI	MBA
	2238389	JITENDAR KASWAN	NEW DELHI	MBA
	2238390	RITURAJ BHATI	VARANASI	MCA
	2238411	AMIT KUMAR JAIN	NEW DELHI	BCA
BLOCK 3	2238412	PAWAN TIWARI	AJMER	MCA
	2238414	SUPRIYA SWAMI	NEW DELHI	MCA
	2238422	KAMLESH KUMAR	MUMBAI	BSC
	2258014	DAVEN SINGHAL	MUMBAI	BCA
BLOCK 4	2258015	S SRIVASTAVA	MUMBAI	BCA
	2258017	SHWETA SINGH	NEW DELHI	BSC
	2258018	ASHISH TIWARI	MUMBAI	MCA
	2258019	SEEMA RANI	LUCKNOW	MBA

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Question 6:

Illustrate the differences between Hierarchical, Network and Relational data models with the help of suitable examples. Explain why relational data model is a better choice over the two. Justify your answer.

Ans-

HIERARCHICAL DATA MODEL

The hierarchical data model organizes data in a tree structure. There is a hierarchy of parent and child data segments. This structure implies that a record can have repeating information, generally in the child data segments. Data in a series of records, which have a set of field values attached to it. It collects all the instances of a specific record together as a record type. These record types are the equivalent of tables in the relational model, and with the individual records being the equivalent of rows. To create links between these record types, the hierarchical model uses Parent Child Relationships. These are a 1:N mapping between record types.

NETWORK MODEL

The popularity of the network data model coincided with the popularity of the hierarchical data model. Some data were more naturally modeled with more than one parent per child. So, the network model permitted the modeling of many-to-many relationships in data. Thus, the complete network of relationships is represented by several pairwise sets; in each set some (one) record type is owner (at the tail of the network arrow) and one or more record types are members (at the head of the relationship arrow). Usually, a set defines a 1:M relationship, although 1:1 is permitted.

RELATIONAL MODEL

(RDBMS - relational database management system) A database based on the relational model developed by E.F. Codd. A relational C constraints. In such a database the data and relations between them are organised in tables. A table is a collection of records and each record in a table contains the same fields.

Properties of Relational Tables:

- Values Are Atomic
- Each Row is Unique
- Column Values Are of the Same Kind

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- The Sequence of Columns is Insignificant
- The Sequence of Rows is Insignificant
- Each Column Has a Unique Name .

The relational model focuses on representing data through relationships held between those data items. This approach has its theoretical basis in set theory and predicate logic - data is therefore represented in the form of tuples . The data in the relational model is queried/manipulated using relational algebra or relational .The Relational DBMS is concerned with how the relational model will be implemented. The data from the relational data model is represented in the form of tables and rows. The data is queried using particular query languages, most commonly this is a language known as SQL (Sequential Query Language).