CMR
INSTITUTE OF
TECHNOLOGY

SCHEME OF EVALUATION

Internal Assessment Test I – Sep. 2016

Sub:	Data Base Management Systems			**Code:**	10CS54
Date: 07/09/2016	Duration: 90 mins	Max Marks: 50	**Sem:** V	**Branch:**	CSE

Note: Answer any 5 full questions

Q. No	Questions	Marks	Split up of Marks
1.(a)	What are spurious tuples? Give an example	2	Explanation 1M + example 1M
(b)	Discuss the main characteristics of database approach.	8	4M * 2
2.	List and explain with examples the set theory operations used in relational data model.	10	3M for union + 3M for intersection + 3M for difference + 1M for relation
3.	Design the ER diagram for Company Data base system.	10	Diagram 10m
4.	Consider the Company DATABASE: Specify the following queries in relational algebra: a. For every project located in 'Sugarland', list the project number, the controlling department number, and the department manager's last name, address and birth date. b. For each project, list the project name and the total hours per week (by all employees) spent of that project. c. Make a list of project numbers for projects that involve en employee whose last name is 'Wong' either as a manager of the department that controls the project or as a worker. d. List the names of manager who have at least one dependent	10	2.5M X 4
5.	Consider the company database: Specify the following queries in relational algebra:	10	2.5M X 4

	a. Retrieve the name and address of employee who work for the "Design" department. b. Find the names of employee who work on all projects controlled by department no.3 c. Retrieve the names of employees who have no dependents. d. Retrieve the names of all employees in department 5 who work more than 10 hours per week on ProductX project.		
6.	List and explain the various types of ER notation along with suitable examples.	10	5M for diagram + 5M for explanation
7.	Explain the following terms with suitable examples. a. Entity type. b. Foreign key. c. Participation Constraint. d. Cardinality Ratio.	10	2.5M X 4
8.	Define schemas, Instance and database management system? Explain with example.	10	2.5M *2 + 5M

CMR
INSTITUTE OF
TECHNOLOGY

DBMS **FIRST IAT SOLUTION**

Internal Assessment Test I – Sep. 2016

Sub:	Data Base Management Systems			**Code:**	10CS54
Date**:** 07/09/2016	Duration: 90 mins	Max Marks: 50	**Sem:** V	**Branch:**	CSE

Note: Answer any 5 full questions

1.(a) What are spurious tuples? Give an example

Solution:

A spurious tuple is a record in a database that gets created when two tables are joined badly. In database spurious tuples are created when two tables are joined on attributes that are neither primary keys nor foreign keys.

Eg:

EMP_LOCS

ENAME	PLOCATION
Smith, John B.	Bellaire
Smith, John B.	Sugarland
Narayan, Ramesh K.	Houston
English, Joyce A.	Bellaire
English, Joyce A.	Sugarland
Wong, Franklin T.	Sugarland
Wong, Franklin T.	Houston
Wong, Franklin T.	Stafford
Zelaya, Alicia J.	Stafford
Jabbar, Ahmad V.	Stafford
Wallace, Jennifer S.	Stafford
Wallace, Jennifer S.	Houston
Borg,James E.	Houston

EMP_PROJ1

SSN	PNUMBER	HOURS	PNAME	PLOCATION
123456789	1	32.5	Product X	Bellaire
123456789	2	7.5	Product Y	Sugarland
666884444	3	40.0	Product Z	Houston
453453453	1	20.0	Product X	Bellaire
453453453	2	20.0	Product Y	Sugarland
333445555	2	10.0	Product Y	Sugarland
333445555	3	10.0	Product Z	Houston
333445555	10	10.0	Computerization	Stafford
333445555	20	10.0	Reorganization	Houston
999887777	30	30.0	Newbenefits	Stafford
999887777	10	10.0	Computerization	Stafford
987987987	10	35.0	Computerization	Stafford
987987987	30	5.0	Newbenefits	Stafford
987654321	30	20.0	Newbenefits	Stafford
987654321	20	15.0	Reorganization	Houston
888665555	20	null	Reorganization	Houston

(b) Discuss the main characteristics of database approach.

Solution:

1. Self-describing nature of a database system:

   A fundamental characteristic of the database approach is that the database system contains not only the database itself but also a complete definition or description of the database structure and constraints. This definition is stored in the DBMS catalog, which contains information such as the structure of each file, the type and storage format of each data item, and various constraints on the data. The information stored in the catalog is called meta-data, and it describes the structure of the primary database

2. Insulation between programs and data, and data abstraction:

   In traditional file processing, the structure of data files is embedded in the application programs, so any changes to the structure of a

file may require changing all programs that access that file. By contrast, DBMS access programs do not require such changes in most cases. The structure of data files is stored in the DBMS catalog separately from the access programs. We call this property program-data independence.

3. Support of multiple views of the data:

   A database typically has many users, each of whom may require a different perspective or **view** of the database. A view may be a subset of the database or it may contain **virtual data** that is derived from the database files but is not explicitly stored. Some users may not need to be aware of whether the data they refer to is stored or derived. A multiuser DBMS whose users have a variety of distinct applications must provide facilities for defining multiple views. For example, one user of the database may be interested only in accessing and printing the transcript of each student. A second user, who is interested only in checking that students have taken all the prerequisites of each course for which they register, may require a different view.

4. **Sharing** of data and multiuser transaction processing:

   A multiuser DBMS, as its name implies, must allow multiple users to access the database at the same time. This is essential if data for multiple applications is to be integrated and maintained in a single database. The DBMS must include **concurrency control** software to ensure that several users trying to update the same data do so in a controlled manner so that the result of the updates is correct. For example, when several reservation agents try to assign a seat on an airline flight, the DBMS should ensure that each seat can be accessed by only one agent at a time for assignment to a passenger. These types of applications are generally called **online transaction processing (OLTP)** applications. A fundamental role of multiuser DBMS software is to ensure that concurrent transactions operate correctly and efficiently.

2. List and explain with examples the set theory operations used in relational data model.

Solution:

UNION, INTERSECTION, and MINUS Operations

We can define the three operations UNION, INTERSECTION, and SET DIFFERENCE on two union-compatible relations *R* and *S* as follows:

- UNION: The result of this operation, denoted by *R U S*, is a relation that includes all tuples that are either in *R* or in *S* or in both *R* and *S*. Duplicate tuples are eliminated.

- INTERSECTION: The result of this operation, denoted by $R \cap S$, is a relation that includes all tuples that are in both R and S.
- SET DIFFERENCE (or MINUS): The result of this operation, denoted by $R - S$, is a relation that includes all tuples that are in R but not in S.

Figure 6.4
The set operations UNION, INTERSECTION, and MINUS. (a) Two union-compatible relations. (b) STUDENT ∪ INSTRUCTOR. (c) STUDENT ∩ INSTRUCTOR. (d) STUDENT − INSTRUCTOR. (e) INSTRUCTOR − STUDENT.

(a) **STUDENT**

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

INSTRUCTOR

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Yao
Francis	Johnson
Ramesh	Shah

(b)

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert
John	Smith
Ricardo	Browne
Francis	Johnson

(c)

Fn	Ln
Susan	Yao
Ramesh	Shah

(d)

Fn	Ln
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

(e)

Fname	Lname
John	Smith
Ricardo	Browne
Francis	Johnson

3. Design the ER diagram for Company Data base system.

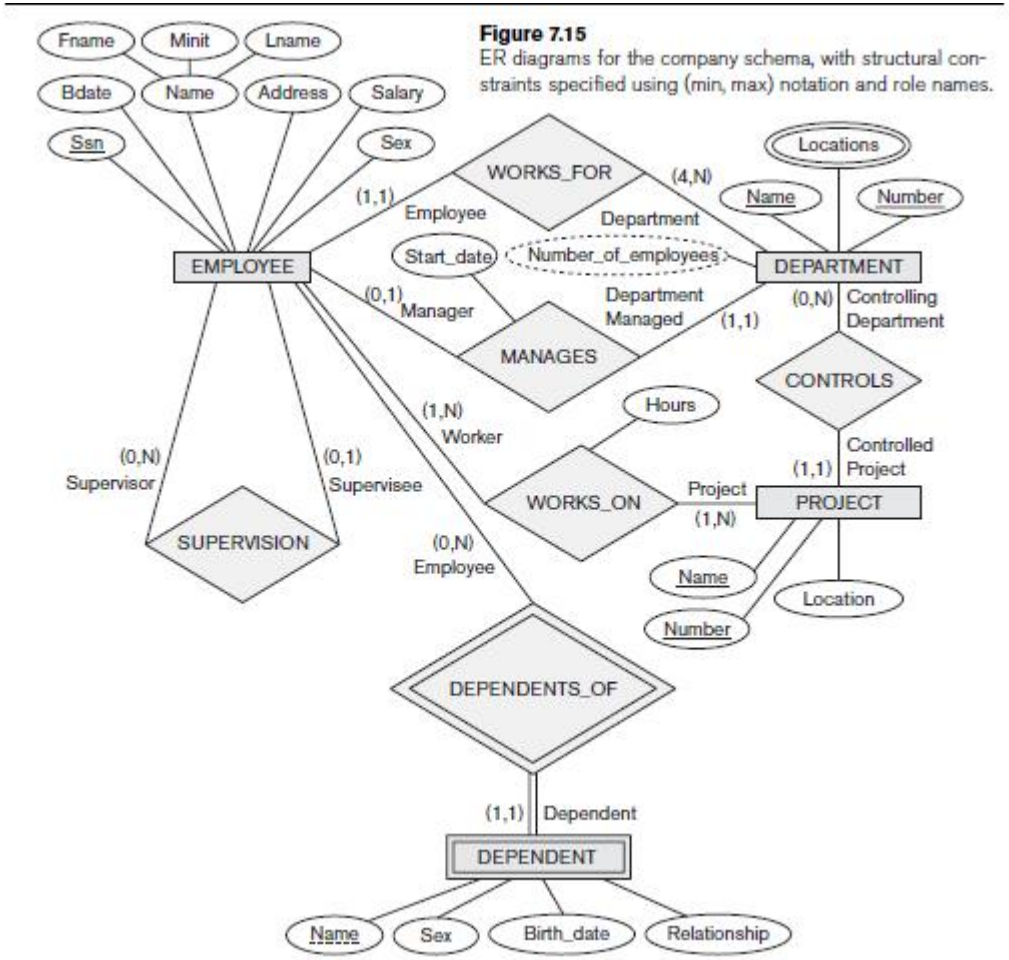


Figure 7.15
ER diagrams for the company schema, with structural constraints specified using (min, max) notation and role names.

4. Consider the Company DATABASE: Specify the following queries in relational algebra:

   a. For every project located in ‘Sugarland’, list the project number, the controlling department number, and the department manager’s last name, address and birth date.

   b. For each project, list the project name and the total hours per week (by all employees) spent of that project.

   c. Make a list of project numbers for projects that involve en employee whose last name is ‘Wong’ either as a manager of the department that controls the project or as a worker.

   d. List the names of manager who have at least one dependent

Solution:

a) For every project located in 'Sugarland', list the project number, the controlling department number, and the department manager's last name, address and birth date.

$\pi_{(Pnumber,\ Dnum,\ Lname,Address,Bdate)}\ (((\pm_{Dlocation\ =\text{'Sugarland'}}(PROJECTS))\ \bowtie_{Dnum=Dnumber}\ DEPARTMENT))\ \bowtie_{Mgrssn=Ssn}\ EMPLOYEE))$

b) For each project, list the project name and the total hours per week(by all employees) spent of that project.

$_{Pno}\Im_{PNAME,\ SUM\ HOURS}((\ (PROJECTS)\ \bowtie_{pno=Pnumber}\ WORKS\_FOR)$

c) Make a list of project numbers for projects that involve en employee whose last name is 'Wong' either as a manager of the department that controls the project or as a worker .

$\pi_{(Pnumber}\ (\pm_{Lname\ =\text{'Wong'}}\ (EMPLOYEE\ \bowtie_{SSN=ESSN}\ WORKSFOR\ )\ )\ \cup$

$\pi_{(Pnumber}\ (\pm_{Lname\ =\text{'Wong'}}\ (EMPLOYEE\ \bowtie_{SSN=mgrSSN}\ DEPARTMENT\ )\ )\ \bowtie_{DNO=\ DNUMBER}\ PROJECT\ )$

d) List the names of manager who have at least one dependent

$\pi_{(Fname,\ Lname)}\ ((DEPARTMENT\ \bowtie_{MGRSSN=SSN}\ EMPLOYEE\ )\ \bowtie ESSN_{=SSN}\ DEPENDENT)$

5. Consider the company database: Specify the following queries in relational algebra:

a. Retrieve the name and address of employee who work for the "Design" department.

b. Find the names of employee who work on all projects controlled by department no.3

c. Retrieve the names of employees who have no dependents.

d. Retrieve the names of all employees in department 5 who work more than 10 hours per week on ProductX project.

Solution:

Consider the database of the company: Specify the following queries in relational algebra:

a) Retrieve the name and address of all employees who work for the design department.

$\pi_{(Fname, Lname, Address)}(\pm_{Dname = 'Design'}(EMPLOYEE \bowtie_{Dno=Dnumber} DEPARTMENT))$

ii)Find the names of employee who work on all projects controlled by department no.3

$ALL\_EMP \leftarrow \pi_{(Essn,Pno)}(WORKS\_ON)$

$PROJNO\_3(Pno) \leftarrow \pi_{(Pnumber)}(\pm_{Dno=3}(PROJECTS))$

$SSN\_EMP \leftarrow ALL\_EMP \div PROJNO\_3$

$\pi_{(Fname, Lname)}(EMPLOYEE \bowtie_{Ssn=Essn} SSN\_EMP)$

b) Retrieve the names of employees who have no dependents.

$\pi_{(Fname, Lname)}((\pi_{(Ssn,)}(EMPLOYEE) - \rho_{(Ssn)}(\pi_{(Essn,)}(DEPENDENT))) * (EMPLOYEE))$

c) Retrieve the names of all employees in department 5 who work more than 10 hours per week on 'ProductX' project.

$\pi_{(Fname, Lname)}((\pm_{Dno=5}(EMPLOYEE)) \bowtie_{Ssn=Essn} (\pm_{Hours >= 10}((\pm_{DNAME = 'ProductX'}(PROJECTS)) \bowtie_{Pnumber=Pno} WORKS\_ON))))$

6. List and explain the various types of ER notation along with suitable examples.

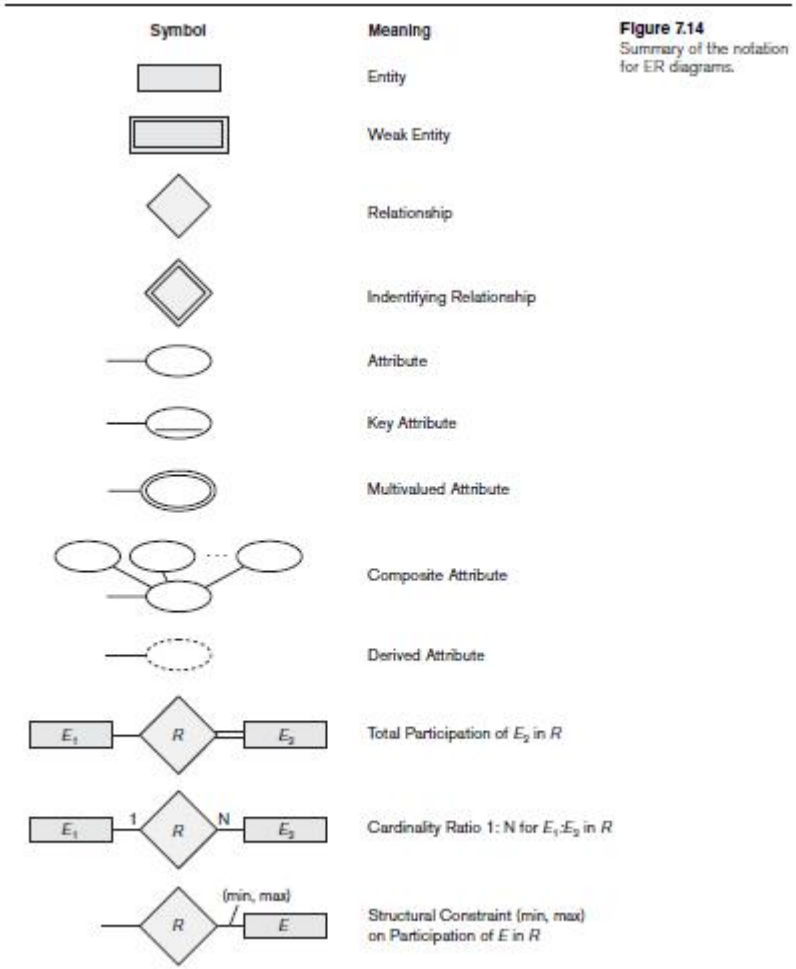


Figure 7.14
Summary of the notation for ER diagrams.

7. Explain the following terms with suitable examples.

   a. Entity type.

   b. Foreign key.

   c. Participation Constraint.

   d. Cardinality Ratio.

   Solution:

Entity type.

The entity type is the fundamental building block for describing the structure of data with the Entity Data Model (EDM). In a conceptual model, an entity type represents the structure of top-level concepts, such as customers or orders. An entity type is a template for entity type instances. Each template contains the following information:

A unique name. (Required.)

An entity key defined by one or more properties. (Required.)

In an application, an instance of an entity type represents a specific object (such as a specific customer or order). Each instance of an entity type must have a unique entity key within an entity set.

Foreign key:

A foreign key is a field (or collection of fields) in one table that uniquely identifies a row of another table. In simpler words, the foreign key is defined in a second table, but it refers to the primary key in the first table. For example, a table called Employee has a primary key called employee_id. Another table called Employee Details has a foreign key which references employee_id in order to uniquely identify the relationship between both the tables.

The table containing the foreign key is called the child table, and the table containing the candidate key is called the referenced or parent table.

Participation Constraint:

There are two types of participation constraints—total and partial.

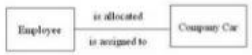
The participation of an entity set *E* in a relationship set *R* is said to be **total** if every entity in *E* participates in at least one relationship in *R*.

If only some entities in *E* participate in relationships in *R*, the participation of entity set *E* in relationship *R* is said to be **partial**.

Cardinality Ratio:

There are three degrees of Cardinality, known as:

- **One-to-One** (1:1):One occurrence of an entity relates to only one occurrence in another entity.



- **One-to-Many** (1:M): One occurrence in an entity relates to many occurrences in another entity.

- **Many-to-Many** (M:N) Many occurrences in an entity relate to many occurrences in another entity.

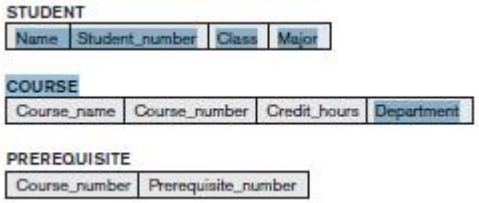
---

8. Define schemas, Instance and database management system? Explain with example.

Solution:

Schemas:

The description of a database is called the **database schema**, which is specified during database design and is not expected to change frequently. Most data models have certain conventions for displaying schemas as diagrams. A displayed schema is called a **schema diagram**



Instance:

The actual data in a database may change quite frequently. For example, the database changes every time we add a new student or enter a new grade. The data in the database at a particular moment in time is called a **database state** or **snapshot**. It is also called the *current* set of **occurrences** or **instances.**

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

Database management system:

A **database management system (DBMS)** is a collection of programs that enables users to create and maintain a database. The DBMS is a *general-purpose software system* that facilitates the processes of *defining*, *constructing*, *manipulating*, and *sharing* databases among various users and applications. **Defining** a database involves specifying the data types, structures, and constraints of the data to be stored in the database. The database definition or descriptive information is also stored by the DBMS in the form of a database catalog or dictionary; it is called **meta-data**. **Constructing** the database is the process of storing the data on some storage medium that is controlled by the DBMS. **Manipulating** a database includes functions such as querying the database to retrieve specific data, updating the database to reflect changes in the miniworld, and generating reports from the data. Sharing a database allows multiple users and programs to access the database simultaneously.

Eg: sql