CMR

INSTITUTE OF TECHNOLOGY

USN										

Internal Assessment Test 1 – September 2016

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

Note: Answer any five questions:

1\. a) What is a database? What are the implicit properties of a database? — 4M

Definition:1M

Properties + Explanation:3M

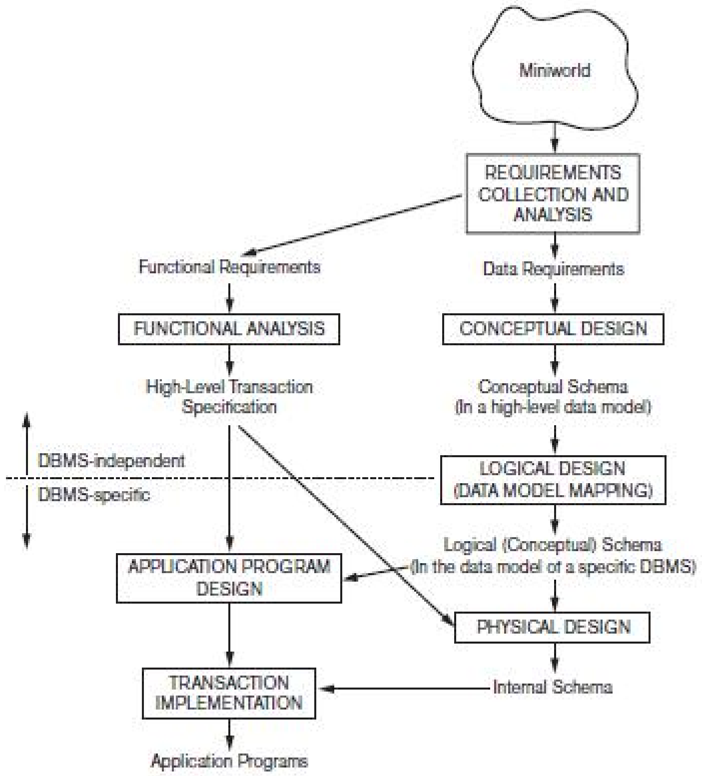
A Database is a collection of related data. By data,we mean known facts that can be recorded and that have implicit meaning.

- A database represents some aspect of the real world, sometimes called the **miniworld** or the **universe of discourse (UoD)**. Changes to the miniworld are reflected in the database.
- A database is a logically coherent collection of data with some inherent meaning. A random assortment of data cannot correctly be referred to as a database.
- A database is designed, built, and populated with data for a specific purpose.It has an intended group of users and some preconceived applications in which these users are interested.

b) Explain ,with the help of a neat sketch,different phases of database design. — 6M

Diagram-3M

Explanation-3M



The first step shown is **requirements collection and analysis**. During this step, the database designers interview prospective database users to understand and document their **data requirements**. The result of this step is a concisely written set of users' requirements.These requirements should be specified in as detailed and complete a form as possible. In parallel with specifying the data requirements, it is useful to specify the known **functional requirements** of the application. These consist of the userdefined **operations** (or **transactions**) that will be applied to the database, including both retrievals and updates.

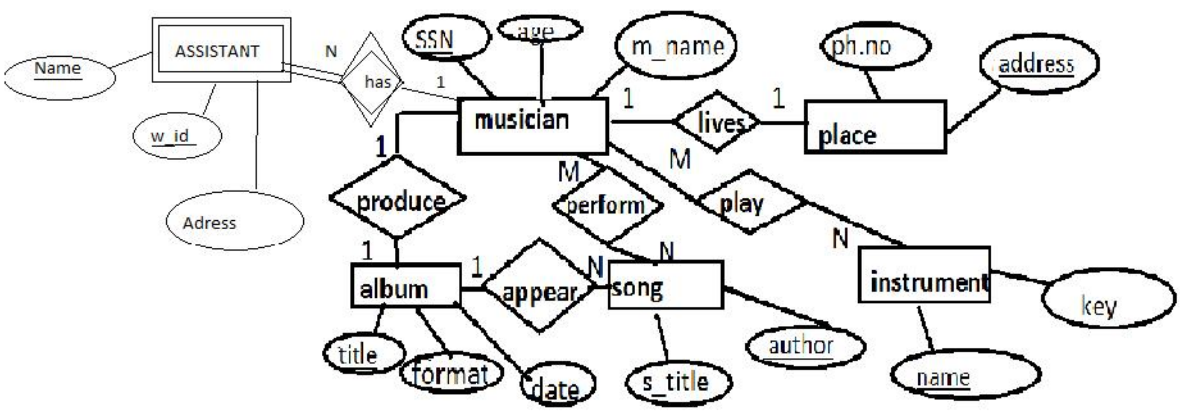
Once the requirements have been collected and analyzed, the next step is to create a **conceptual schema** for the database, using a high-level conceptual data model. This step is called **conceptual design**. The conceptual schema is a concise description of the data requirements of the users and includes detailed descriptions of the entity types, relationships, and constraints; these are expressed using the concepts provided by the high-level data model. The next step in database design is the actual implementation of the database, using a commercial DBMS. Most current commercial DBMSs use an implementation data model—such as the relational or the object-relational database model—so the conceptual schema is transformed from the high-level data model into the implementation data model. This step is called **logical design** or **data model mapping**; its result is a database schema in the implementation data model of the DBMS.

The last step is the **physical design** phase, during which the internal storage structures,file organizations, indexes, access paths, and physical design parameters for the database files are specified. In parallel with these activities, application programs are designed and implemented as database transactions corresponding to the highlevel transaction specifications.

2. a) The Beatles record has decided to store information about musicians who perform on its albums in a database. Each musician identified by an SSN, a name and an age. Each musician lived in different places. Places are identified by an address and a ph.no. Each instrument is identified by a name and a key. Each album has a title, date and a format. Each song has a title and an author. Each musician plays several instruments and a given instrument played by several musicians. Each album has many songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians and a musician may perform a many songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums. Each musician has got one more assistants. Each assistant has a name and an address. **10M**

1. Draw the ER diagram for the above scenario.(Include cardinality as well as participation)
2. Identify the entity types.
3. Identify the key attributes of each entity type.
4. Is there any weak entity type? If so, identify the ones.

ER Diagram-6M
Entity types-1M
Key Atrributes-1M
Weak Entity type-2M



MUSICIAN RECORD

3. a) List the set theoretic operations used in relational data model.Explain any two with examples. 4M 6M

Listing the operations-1M
Explanation of 2 operations with example-3M

UNION,INTERSECTION,MINUS,CARTESIAN PRODUCT

<u>UNION</u>

DEP5_EMPS ← σDno=5(EMPLOYEE)
RESULT1 ← πSsn(DEP5_EMPS)
RESULT2(Ssn) ← πSuper_ssn(DEP5_EMPS)
RESULT ← RESULT1 ∪ RESULT2

The relation RESULT1 has the Ssn of all employees who work in department 5,whereas RESULT2 has the Ssn of all employees who directly supervise an employee who works in department 5. The UNION operation produces the tuples that are in either RESULT1 or RESULT2 or both while eliminating any duplicates.Thus, the Ssn value '333445555' appears only once in the result.

RESULT1

Ssn
123456789
333445555
666884444
453453453

RESULT2

Ssn
333445555
888665555

RESULT

Ssn
123456789
333445555
666884444
453453453
888665555

INTERSECTION

The result of this operation, denoted by *R* ∩ *S*, is a relation that includes all tuples that are in both *R* and *S*.

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

STUDENT INTERSECT INSTRUCTOR (STUDENT ∩ INSTRUCTOR)

Fn	Ln
Susan	Yao
Ramesh	Shah

b) What is a constraint?Define Domain constraint,Key constraint, Entity Integrity and Referential Integrity constraints with examples.

Definition of each constraint-1(1*4)
Example fo each constraint-0.5(0.5*4)

Domain Constraint

Domain constraints specify that within each tuple, the value of each attribute *A* must be an atomic value from the domain dom(*A*).
Example: **Employee_ages.** Possible ages of employees in a company; each must be an integer value between 15 and 80.

Key Constraint

Two distinct tuples in any state of the relation cannot have identical values for (all) the attributes in the key

Entity integrity constraint

The **entity integrity constraint** states that no primary key value can be NULL.

Referential integrity constraint

The **referential integrity constraint** is specified between two relations and is used to maintain the consistency among tuples in the two relations. Informally, the referential integrity constraint states that a tuple in one relation that refers to another relation must refer to an *existing tuple* in that relation

Example

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

In DEPARTMENT Table,
Dnumber:Primary Key
In DEPT_LOCATIONS table,Dnumber:Foreign Key

4. a) Consider the following relations: **6M**

Doctor(SSN, FirstName, LastName, Specialty, YearsOfExperience, PhoneNum)
Patient(SSN, FirstName, LastName, Address, DOB, PrimaryDoctor_SSN)
Medicine(TradeName, UnitPrice, GenericFlag)
Prescription(Id, Date, Doctor_SSN, Patient_SSN)
Prescription_Medicine(Prescription Id, TradeName, NumOfUnits)
Write the **relational algebra** expressions for the following queries

1. List the trade name of generic medicine with unit price less than $50.(Generic medicine will have GenericFlag=’Y’ in Medicine table)
2. List the first and last name of patients whose primary doctor named ‘John Smith’.
3. List the first and last name of doctors who are not primary doctors to any patient.

Each expression-2M

1. List the trade name of generic medicine with unit price less than $50. **4M**

   $\Pi_{TradeName}\ (\sigma_{genereicFlag=True\ and\ UnitPrice<\ 50}(Medicine))$

2. List the first and last name of patients whose primary doctor named ‘John Smith’.

   $R1 \longleftarrow \Pi_{SSN}(\sigma_{FirstName='John' and\ LastName='Smith'}(Doctor))$
   $Result \longleftarrow\ \Pi_{FirstName,LastName}(R1 \bowtie_{SSN=PrimaryDoctor\_SSN}(Patient))$

3. List the first and last name of doctors who are not primary doctors to any patient.

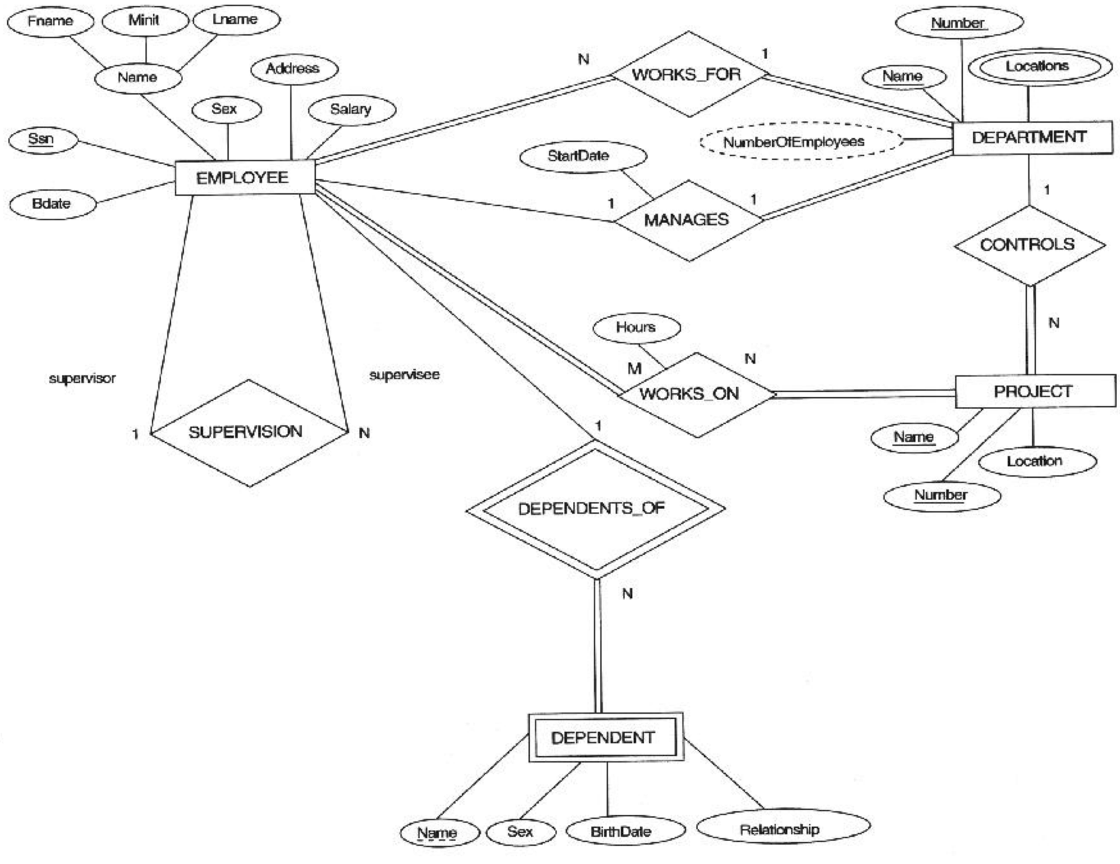
   $R1(\ SSN) \longleftarrow \Pi_{SSN}(Doctor) - \Pi_{PrimaryDoctor\_SSN}(Patient)$

   $Result \longleftarrow\ \Pi_{FirstName,LastName}(R1 \bowtie Doctor)$

b) The tables ITEM and COMPANY are given below.Write the results of ITEM X COMPANY and ITEM ⋈ COMPANY

ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_NO
1	Chex Mix	Pcs	16
6	Cheez-It	Pcs	15
2	BN Biscuit	Pcs	15
3	Mighty Munch	Pcs	17
4	Pot Rice	Pcs	15
5	Jaffa Cakes	Pcs	18

COMPANY_ID	COMPANY_NAME	COMPANY_CITY
18	Order All	Boston
15	Jack Hill Ltd	London
16	Akas Foods	Delhi
17	Foodies.	London
19	sip-n-Bite.	New York

5.	There are many workers working under a project. Each worker is identified by name, worker id and by address. A worker can belong to only one department. Several workers may belong to single department and may participate in many projects. Each department is identified by name, department id and by address. Similarly the projects have got its' own project id and name. The products too got their own name and product id. The project may include several buy orders(order to buy products) that contains the product details .Buy orders are delivered by suppliers. The buyorders are specified by their orderId, orderdate and delivery date. Same way, suppliers are specified by their name and supplier id. A worker can have assistants. Each assistant will have a name and age stored. 1. Draw the ER diagram for the above scenario.(include cardinality as well as participation) 2. Identify the entity types. 3. Identify the key attributes of each entity type. 4. Identify the relationships 5. Is there any weak entity type? If so, identify the ones **ER Diagram-6M** **Entity types-1M** **Key Atrributes-1M** **Weak Entity type-2M**	10M
6.	 Convert the above ER diagram to Relational Model. Clearly specify the keys and relationships.	10M

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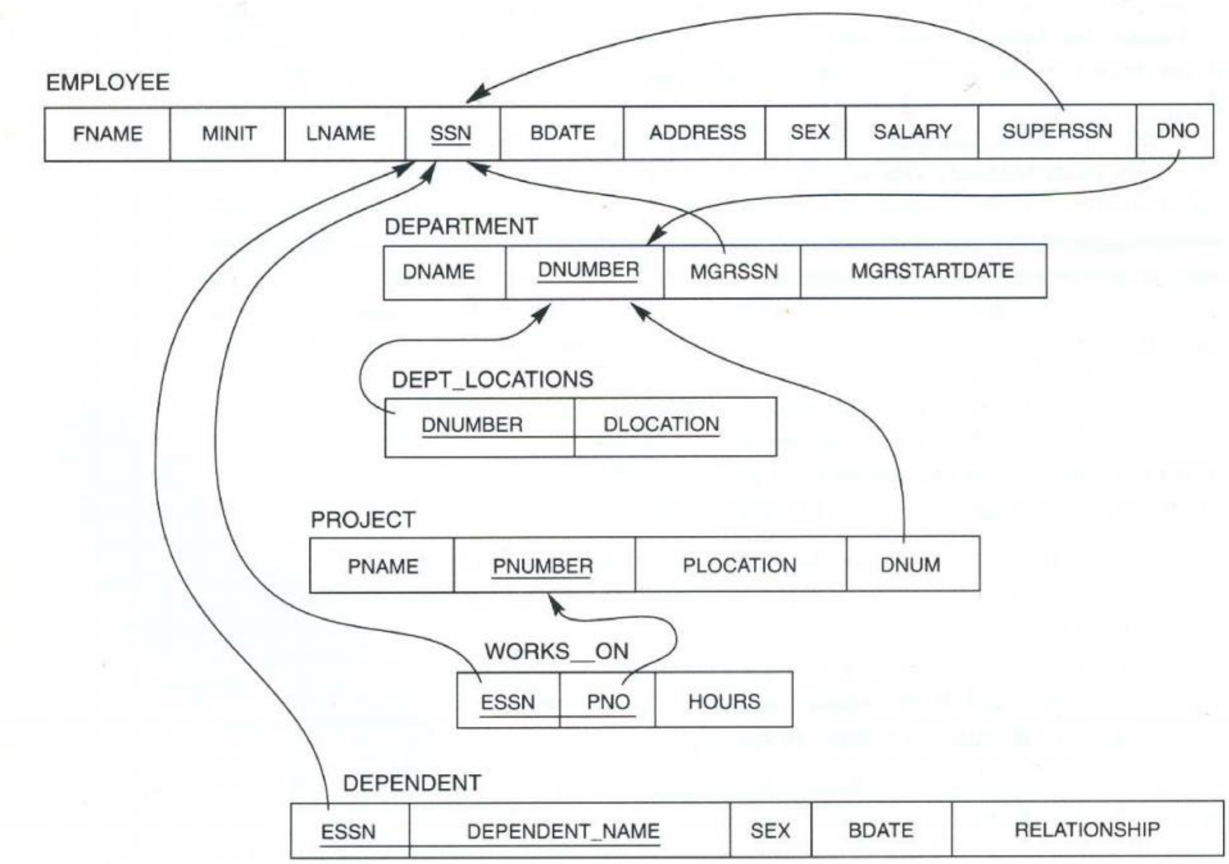

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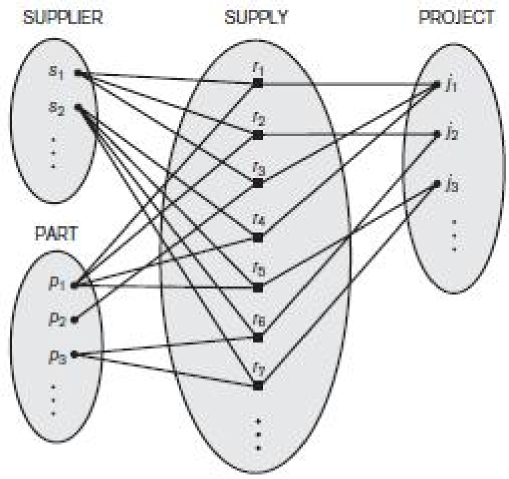
a) Briefly explain Composite Vs Simple attributes and Single-Valued Vs Multivalued attributes with examples.
b) What are ternary relationships? Give one example.
Degree of a Relationship Type. The degree of a relationship type is the number of participating entity types. Hence, the WORKS_FOR relationship is of degree two.A relationship type of degree two is called binary, and one of degree three is called ternary. An example of a ternary relationship is SUPPLY, shown in figure, where each relationship instance ri associates three entities—a supplier s, a part p,and a project j—whenever s supplies part p to project j. Relationships can generally be of any degree, but the ones most common are binary


relationships.
</td>
<td>6M
4M</td>
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<td>8.</td>
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a) Consider the following schema and write the relational algebra expressions for the queries given below.
Supplier(sid: integer,sname:string,address:string)
Parts(pid: integer,pname:string,color:string)
Catalog(sid:integer,pid:integer,cost:real)
i. Find the names of suppliers who supply some red parts.
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<td>10M</td>
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ii. Find the sid of suppliers who supply some red parts or at221 packer street.

iii. Find the sid of suppliers who supply some red parts and some green part.

$$\pi_{sname}(\pi_{sid}((\pi_{pid}\sigma_{color='red'}Parts) \bowtie Catalog) \bowtie suppliers)$$

$$\pi_{sid}((\pi_{pid}\sigma_{color='red'}Parts) \bowtie Catalog) \cup \pi_{sid}\sigma_{address='221\ Packer\ Str'}Suppliers$$

$$\pi_{sid}((\pi_{pid}\sigma_{color='red'}Parts) \bowtie Catalog) \cap \pi_{sid}((\pi_{pid}\sigma_{color='green'}Parts) \bowtie Catalog)$$