B. E.

Fourth Semester Examination, Dec-2006
DATABASE MANAGEMENT SYSTEM

Note : Attempt any five out of eight questions.

Q. 1. What is database system? What are advantages and disadvantages of using a database system?

Ans. A database is a collection of related data. By data, we mean known facts that can be recorded and that have implicit meaning, eg. consider the names, telephone number and addresses of the people. A database management system (DBMS) is a collection of programs that enables users to create and maintains a database DBMS is hence a general-purpose software system that facilitates the processes of defining, constructing, manipulating and sharing databases among.

Advantages :

1. **Controlling redundancy :** The redundancy in storing the same data multiple times leads to several problems. First is the need to perform a single logical update such as enabling data on a new student multiple times, once for each file where student data is recorded. This leads to duplication of effort. Second is storage space is wasted when same data is recorded repeatedly and this problem may be serious for large databases. Third, the file that represent same data may become inconsistent. In database approach, the view of different user groups are integrated derving database design. This ensures consistency and it saves storage space.

2. Restricting unauthorized access.

3. Providing storage structure for efficient query processing.

4. Providing backup and recovery.

5. Providing multiple user interfaces.

6. Representing complex relation ships among data.

7. Enforcing integrity constraints.

8. Permitting inferencing and actions using rules.

9. Additional implications of using the database approach.

Disadvantages :

High initial investment as hardware, software and training.

The generating that a DBMS provides for defining and processing data.

Overhead for providing security, concurrency control, recovery and integrity functions.

Q. 2. Describe in detail, sequential, direct and index file organisation techniques with relative merits and demerits.

Ans. File organisation : Collection of different types of records in single unit is called file. There are

different types of file. There are different types of file systems e.g. sequential file, serial file, index file, direct file.

Sequential file : In sequential file.

Records are maintained in the logical sequence of their primary key values.

Simple but in efficient for random access.

Binary search techniques are used to search for a record.

Update : It requires a creation of a new file i.e. creates an automatic backup.

To maintain the file sequence, records are copied to the record where amendment is required.

Then changes are done and then copied into the new file.

Insertion is same as updation.

Deletion : It requires a compression of the file space and achieved by shifting the records.

Advantage : Case of access of next record.

Disadvantage : Creation of new file is updation and insertion.

Direct File : It searches the record according to the user.

Advantage : No time consumptions

           No record maintains.

Disadvantage : Need to maintain pointer property.

Index File : Index is a set of < key, address> pairs.

This provides a mechanism for faster search. The purpose of indexing is to expadite the search process.

Index file to describe the indexes data file to refer the data records.

A sequential file that is indexed is called indexed sequential file.

The index provide the random access to records and the sequential nature provides easy access to subsequent records.

Q. 3. (a) Define the following terms with reference to tuple relational calculus.

(i) Tuple variable

(ii) Ranger relation

(iii) Atom

(iv) Formula

(v) Relation

Ans. (i) Tuple variable : The tuple relational calculus is based on specifying a no. of tuple variables. Each tuple variable usually ranges over a particular database relation meaning that the variable may take as tis value any individual type form that relation.

A simple tuple relational calculus query is of the form :

$$\{t|\text{COND}(t)\}$$

Where to is tuple variable ϕ.

COND (t) is conditional expression memory t. The result of such a query is the set of all tuples t that satisfy COND (t).

(ii) Range relation : $\{t|\text{EMPLOYEE}(t)\text{ and }t.\text{SALARY}>50000\}$.

The condition EMPLOYEE (t) specifies that the relation range Relation] of tuple variable t is EMPLOYEE. Each employee tuple satisfy the condition t. SALARY>50000 will be retrained.

(iii) Atom : An atom of the form $R(t_i)$, where R is a relation name and t_i is a tuple variable. This atom identifies the range of tuple variable t_i as the relation where name is R.

(iv) Formula : A general expression of the tuple relational calculus is of form,

$$\{t_1.\text{Aj},t_2......t_n.\text{A}_m /\text{COND}(t_1,t_2.....t_n,t_{n+1},t_{n+2}....t_{n+m})\}.$$

Where t_1, t_2 .... t_n, t_{n+1}, t_{n+m} are tuple variable, each A_i is an attribute of the relation on which if ranges, and COND is a condition or formula of the tuple relational calculus.

(v) Relation : It is a set of tuples, mathematically elements of a set have no order among them, hence, tuple in a relation don't have any particular order. It defined as :

$$r=\{t_1,t_2......t_n\}.$$

Q. 3. (b) What does it mean to say that a set of FD's is irreducible?

Ans. Informally, a minimal cover of a set of functional dependencies E is a set of functional dyne devices F that satisfies the property that every dependency in E is the closure F^+ of F.

In addition, this property is lost if any depending from the set F is removed. F must have no redundancies in it, ϕ the dependencies in E are in a standard form.

To satisfy there properties, we can formally define as set of FD's F to be minimal if it satisfy following conditions.

1. Every dependency in F has a single attribute for its night hand side.

2. We cannot remove any dependency from & still have a set of dependencies that is equivalent to F.

Q. 3. (c) Why do we need mapping between the different layers of database architecture?

Ans. Data architecture different layers : It basically is 3-schema architecture. The below figure schemas B-schema architecture.

End users

External level — External view . . . . External view

External/conceptual mapping

Conceptual level — Conceptual schema

Conceptual/internal mapping

Internal level — Internal schema

Stored database

Physical storage structure of the database

It describe whole database for a community of users

It include ext./user views
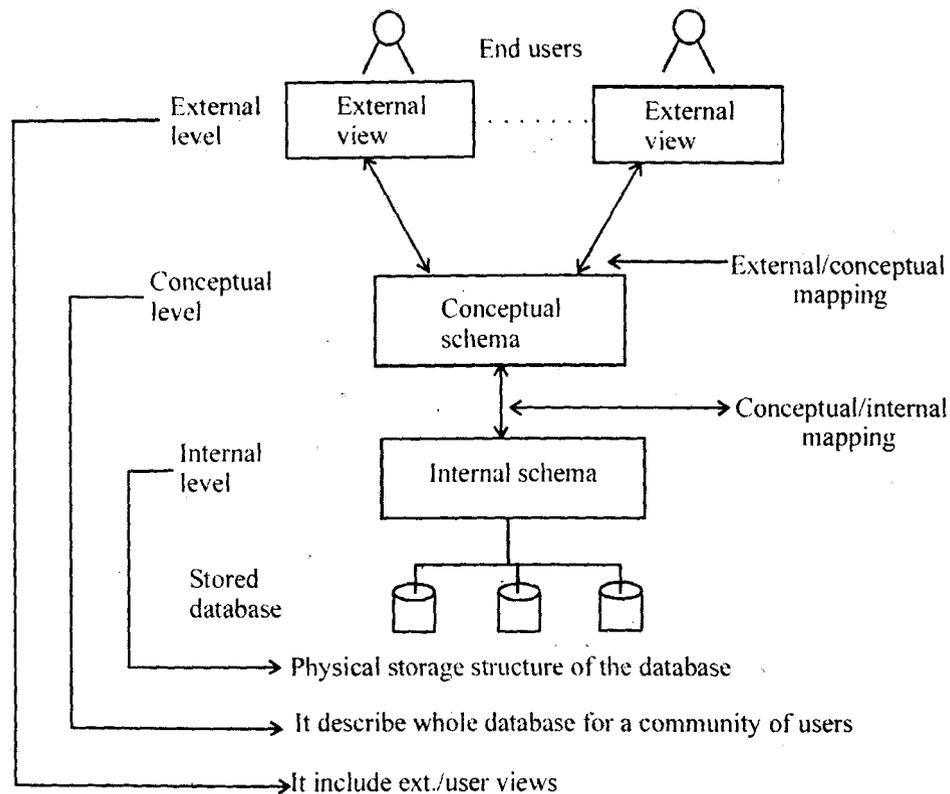
Q. 4. (a) What are the responsibilities of Database Administrator (DBA)?

Ans. DBA responsibilities : In any organization where many persons use the same resources, there is a need for a chief administrator to oversee & image these resources.

In a database environment, the primary resource is the database itself and secondary resource is the DDMS and related s/w. Administering these resources in the responsibility of the DBA data base administration.

The DBA is responsible for authorizing access to the database, for co-ordinating & manicuring its use, & for acquiring s/w & h/w resources as needed.

The DBA is accountable for problems such as break of security or poor system response time.

In larllge organizations the DDA is assisted by a staff that helps carry out these functions.

Q. 4. (b) Write queries in SQL for the following Relational Database :

lives (Personname, street, city) works (personname, company name, salary)

manages (company name, manager name)

located in (company name, city)

(i) Find the name of all people who work for "Universal Bank."

(ii) Find all people who live in same city as company they work for.

Ans. Given

       lives (personname, street, city)

       works (person name, companyname, salary)

       located in (company-name, city)

Find :

(i) Find the name of all people who work for universal bank.

(ii) Find all people who live in same city as company they work for.

1.   Retrieve Name of All people work for universal bank.

      Universal-Bank $\leftarrow \sigma$ Name = 'UNIVERSAL BANK' (WORKS)

      OR

      UNIVERSAL-BANK $\leftarrow \sigma$ Company name = 'UNIVERSAL-BANK' (WORKS)

      UNIVERSAL-EMPS $\leftarrow$ (UNIVERSAL-BANK ... lives)

      RESULT $\leftarrow \pi$ personname (UNIVERSAL-EMPS)

2.   Location $\leftarrow \sigma$ personname = 'Same city' (Located in)

      Worked $\leftarrow \sigma$ personname = 'street' (works).

      RESULT $\leftarrow \pi$personname (location ..... worked).

Q. 5. Discuss network model in detail.

Ans. Network Model : The below figure show a N/w schema diagram for the databased of figure (i) where record types are shown as rectangles & set types are shown as labelled directed arrows.

The network model also known as CODA SYH DBT a Model has an associated record-at-a time language that must be embedded in a Host programing.

The Hierarchical model represents data as Hierarchical the structures each hierarchy represents a no. of related records. There is no standard language for the hierarchical model, although most hierarchical DBMs have record-at-a fine language.

The XML model, now considered the standard for data interchange over the internet, also uses hierarchical free structures. It combines database concepts with concepts form document reference markets. Doctor is reference as elements which can be nested to create complex hierarchical structure. This model conceptually resembles the direct model, but uses different terminology.
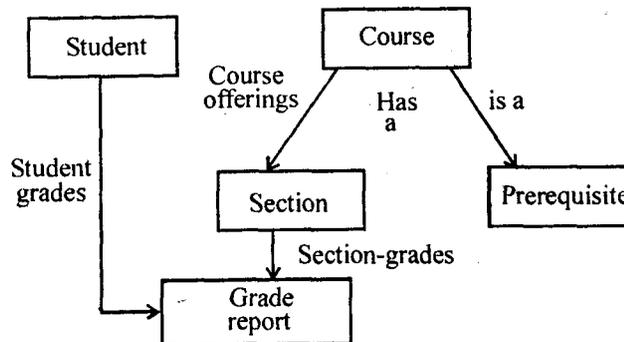
Fig. : Network Model

Q. 6. (a) Why do we need to provide foreign key constraint? How can you enforce referential integrity?

Ans. Foreign key constraint : To define referential integrity more formally we first define concept of foreign key the conditions for a foreign key, given below specify a referential integrity constraint between two relation schemas R_1 and R_2 .

A set of attributed F_k is relation schema R_1 is a foreign key of R_1 that reference relation R_2 if it satisfy the following two rules.

1. The attribution in F_k have the same domains (s) as the primary key attributes P_k of R_2 ; the attributes F_k are said to the reference/refer to the relation R_2 .

2. A value of F_k in a tuple t_1 of the convert state $r_1(R_1)$ either occurs as or value of P_k for some tuple t_2 in the circuit state $r_2(R_2)$ or is null. In the former case, we have $t_1[F_k] = t_2[P_k]$ and, we can say that the tuple t_1 references/refers to the tuple t_2 .

Q. 6. (b) What is the difference between relational algebra and relational calculus.

Ans. Relational algebra : The basic set of operations for the relation model called relational algebra, these operation/algebra used to enable a user to specify basic retrical requests the result of retrical is new relation which formed from one or more relations. A sequence of operation formed a new relation algebra. It is very important because it formed a formal foundation for implenty queries.

Relational calculus : Relational calculus provides a higher-level declarative rotations for specifying relational queries. A relation calculus creators a new relation a, which specified in form of variables. It formed as firm basis in mathematical logic & because the SQL for RDDMs has some of its foundation in the tuple relation calculus.

Q. 7. What is ER Diagram? Explain with suitable example. Give ER diagram that reduce into tables with explanation.

Ans. ER diagrams : It is a popular high level conceptual data model. This model and its variations are frequency used for conceptual designs of data base applications & many database design tools employees its concepts.

The company database E-R diagram is given below :
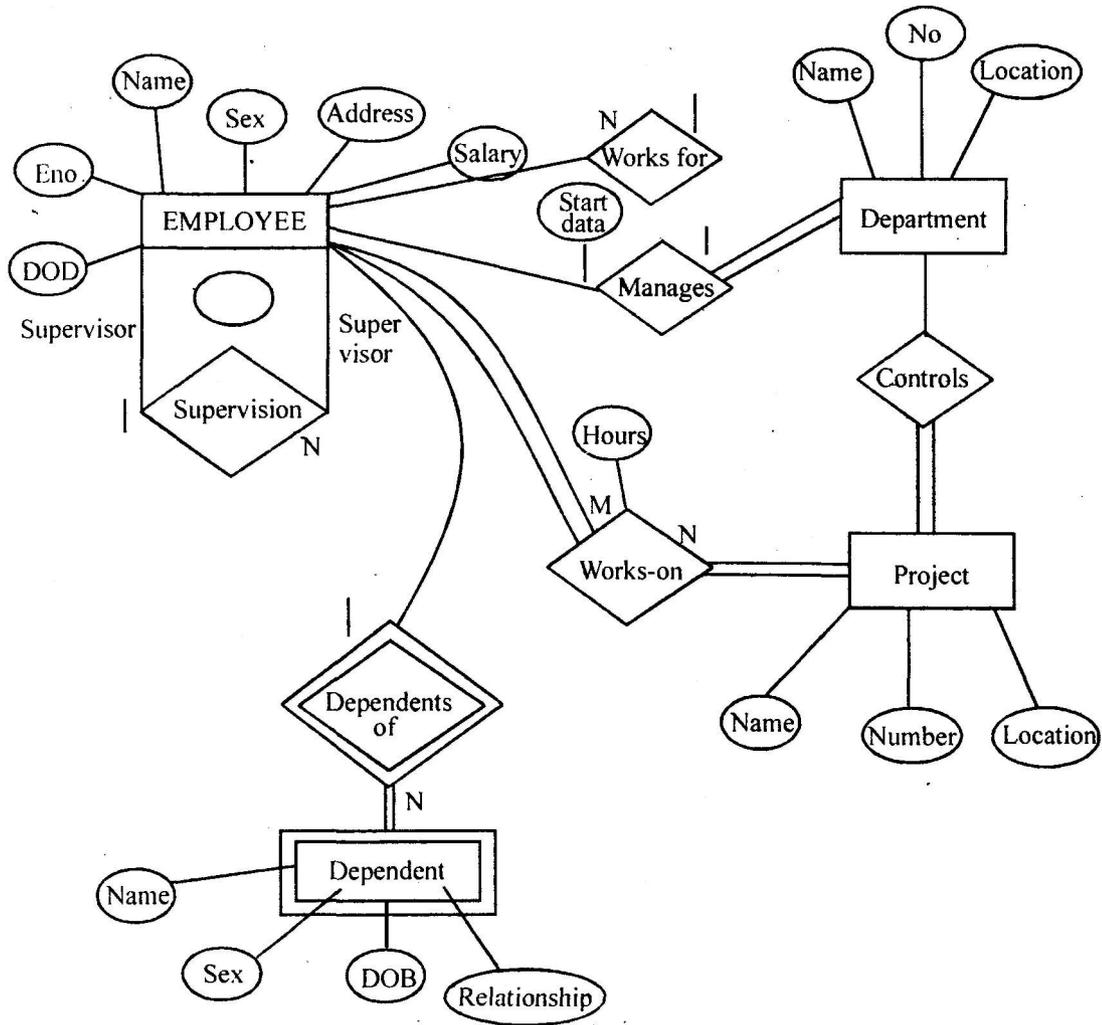
The basic object that the ER model represents is an entity → Things, in the real word.

Each Entity have Attributes → The particular properties that describe it.

For example : An employee's entity has attributes as,

— Name (Fname, initial, ename)

— DOB

— Sex

— Address

— ENO etc.

EMPLOYEE						
E. No.	Name			Sex	Address	DOB
	F	I	C			

Fig. Table form of employee entity

Q. 8. What are concurrency problem? How can they be solved?

Ans. Concurrency problem : The main concurrency problem is related with insertion & deletion of records and it so called PHANTOM PROBLEM, which may occur when records are inserted.

When a new data item is inserted in the database, it obviously cannot be accessed until after the item is heated & the insert operation is concerned. In a locking environment, a lock for the item can be created & set to write exclusive mode, locks can be released at the same time as other write locks wound be released, based an concurrency centre protocol being used. For a time-stamp based protocol, the read & write timestamps of the new item are set to the timestrong of creating transaction.

Next, we consider a deletion operation, that is applied on an existing data item. For looking protocols, again an (write) exclusive lock must be obtained the transaction can delete the item. For timestamp ording, the protocol must ensure that no later transaction has read or within the item, before allowing the item to be deleted.