SIXTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY- MARCH, 2013

DBMS

(For IVth semester CT, IF and for Vth semester CM**)**

(Maximum Mark: 100) (Time:3hr)

PART - A

I. Answer the following questions in one or two sentences .Each question carries two mark

1. List any four advantages of DBMS.

1. Controlled data redundancy
2. Enforcing data integrity
3. Data sharing
4. Ease of application development

2**. List any two Unary relational database operations.**

Select, Project and Rename are Unary operation

3**. Define entity type.**

An entity is a distinguishable object that has an independent existence. A set or collection of entities that share the same attributes but different values are known as an entity type.

4. Write any four transaction state.

- Active Committed
- Partially committed
- Failed
- Aborted.

5. Write the four main components required for the implementation of JDBC.

- Application
- Driver manager
- Data source specific drivers
- corresponding data sources

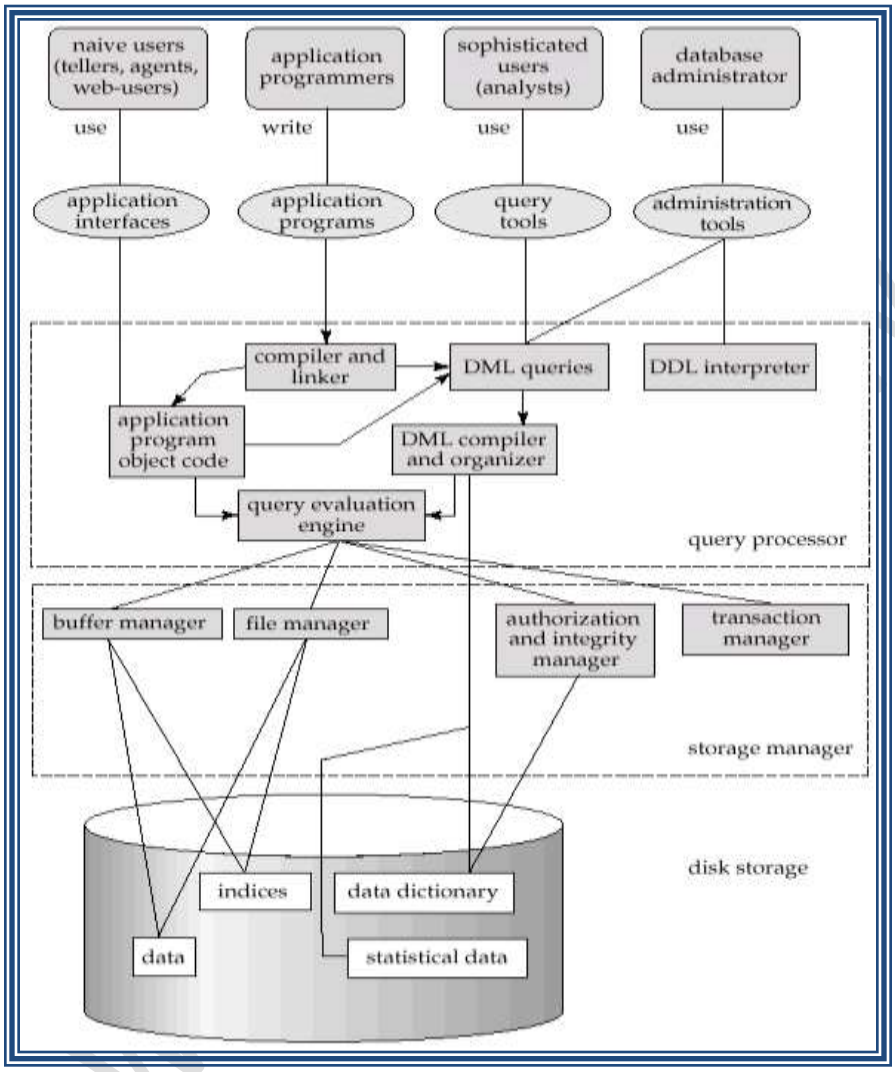
PART – B

II. Answer any five of the following. Each question carries 6 marks.

1. State the advantages of distributed database system.

- Sharing data
- Improved availability and reliability
- Autonomy and Easier expansion
  (each with explanation)

2. Illustrate the component model architecture of DBMS.



- **Storage Management**
- Storage manager is a program module that provides the interface between the low-level data stored in the database and the application programs and queries submitted to the system.
- The storage manager is responsible to the following tasks:
  - interaction with the file manager
  - efficient storing, retrieving and updating of data
- **Concurrency Control**
- Concurrent execution of user programs is essential for good DBMS performance.

- Because disk accesses are frequent, and relatively slow, it is important to keep the cpu humming by working on several user programs concurrently.

- **Transaction Management**
- A *transaction* is a collection of operations that performs a single logical function in a database application
- Transaction-management component ensures that the database remains in a consistent (correct) state despite system failures (e.g., power failures and operating system crashes) and transaction failures.
- Concurrency-control manager controls the interaction among the concurrent transactions, to ensure the consistency of the database.

3. **Define the following items :**

(a) Relation Instance **(c) Key**

(b) Attribute **(d) Domain**

Ans:-

(a) Relation Instance

A relation instance is an ordered set of attributes values that belongs to a Domain and can be denoted as

r = {t1, t2, t3,….tn} where t1, t2, t4 are tuples.

(b) Attribute

The property of an entity that characterizes and describes it.

(c) Key

An attribute or a combination of attributes in relation that uniquely identifies each tuple of that relation.

(d) Domain

The set of permissible values of same data type of an attribute from which an attribute name and a value of one or more bytes are selected from is called Domain.

4. Consider the EMPLOYEE relation given below :

EMP_ID	EMP_Name	EMP_Desg	Dept.

E-001	John	Clerk	Secretariat
E-002	Allwyn	Overseer	KSEB
E-003	Shine	Superintendent	Tech-Education
E-004	Sinoj	Office Assistant	Water Authority

Construct a SELECT operation to retrieve the tuple where EMP_DESG is Supdt. from the EMPLOYEE relation using the phrases of relational algebra.

SQL> select * from EMPLOYEE where EMP_DESG= ‘superintendent’;

5**. Write short notes on the following :**

(a) Functional dependency (c) Join dependency

(b) Create Table (d) Transaction

(a) Functional dependency

Given a relation R with attributes A and B, attribute A of R is functionally dependent on attribute B if each A value in R has associated with it precisely one B value.

(b) Create Table

A relation is said to be in normal form only if it satisfies some constraints.

Eg- If attributes are in invisible state (atomic) then is it in INF.

(c) Join dependency

A join dependency is a constraint on the set of legal relation over a database scheme. A table T is subject to a join dependency if T can always be recreated by joining multiple tables each having a subset of the attributes of T.

(d) Transaction

A collection of operations that form a single logical unit of work is called a transaction.

6**. Write the function of:**

(a) Create Table (b) Alter Table (c) Drop Table

(a) Create Table

This command is used to create a new relation. Its attributes and its data types

Sql> create table employee(employee_name varchar2(10),employee_nonumber(8), dept_name varchar2(10),dept_no number (5),date_of_join date);

(b) Alter Table

It is used to make changes in the structure of a relation like adding new attribute, redefining attribute etc.

Sql> alter table employee1 drop primary key;

(c) Drop Table

This command is used to remove an already existing relation.

Sql> drop table emp;

7. Distinguish between ODBC and JDBC.

ODBC

It provides an interface that the application programs can establish connection with the database. After establishing connection it can communicate through queries.

JDBC

It provides an interface that can access database through Java regardless of DBMS with the help of DBMS specified driver.

PART – C

(Answer one full question from each unit, Each question carries 15 mark)

Unit-I

III. (a) **Distinguish between conceptual Data Model, Representational Data Model and Physical Data Model.** 12

Conceptual data model

Conceptual data model describes the information used by an organization in a way that in independent of any implementation level issues and details.

Representational Data model

The representational data model hide some data storage details from the users

Eg:- Heirarchical, Network and Relational.

Physical Data model

The physical data model describes data in terms of collection of files, indices and other storage structures.

(b) Explain centralized architecture of DBMS. 3

Centralized architecture

The database, application program and user interface are executed on a single system and dummy terminals are connected on it.

OR

IV**. (a) Explain the necessity of a database system**. 5

Necessity of a database system

Early file processing system suffers from a lot of disadvantages like data redundancy, data in consistency etc. To overcome their an organized collection of database was being manipulated using software.

(b) Describe the duties performed by a Database Administrator. 5

Duties of DBA

- Create schema of database
- Install new software related to DBMS
- Security enforcement & administration.
- Data analysis

(c) Construct a Hierarchical Database model with a suitable example. 5

Heirarchical Database model

Unit-II

V. (a) State the advantages of E-R model. 5

Advantages of E-R model

- Simple and easy to understand
- Captures real world data requirements
- Easily mapped onto relational model
- Used as a design plan
- Implemented in any data base design

(b) Define attribute. 2

Attributes

Attributes is the property of an entity that characterizes and describes it.

(c) Explain the different types of attributes. **8**

Types of attributes

(i). Identifying and descriptive attributes
(ii). Simple and composite attributes
(iii). Stored and derived attributes
(iv). Single valued and multi valued attributes
(v). Complex attributes

OR

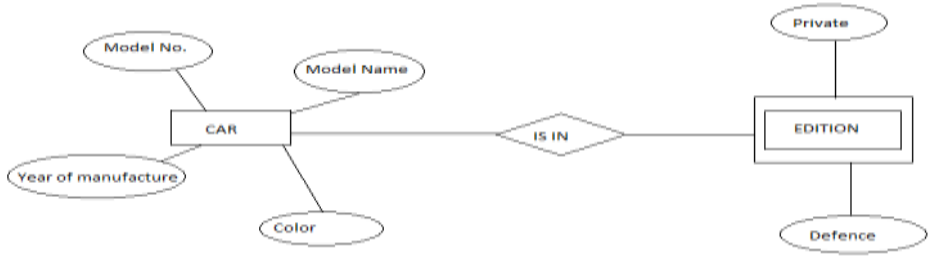
VI. **(a) Devise the concept of E-R diagram.** 3

E-R diagram is a graphical tool that demonstrate the inter relationships among various entities of a database. It is also used to communicate the logical structure of the database to end users. It serves as a documentation tool. It helps the database designer in understanding the information contained in database.

(b) **Distinguish between E-R model and Enhanced E-R model.** 5

- E-R diagram represents the basic concept of the database schema.
- To represent the inheritance among various entity types enhanced E-R or EER diagram are used.
- Specialization and Generalization can also be represented in an EER diagram

(c) Draw an E-R diagram for the entity type CAR with attributes model no., model name, year of manufacture, colour and weak entity type EDITION with attributes, private and defence. (7)



Unit-III

VII. (a) **Explain multi valued dependencies.** 8

Multi valued dependencies

In a relation R, an attribute Y is said to be multi-dependent on attribute X (X $\longrightarrow\!\!\!\!\blacktriangleright\!\!\blacktriangleright$ Y) if and only if for a particular value of X, the set of values of Y is completely determined by the value of X alone and is independent of the values of Z where x, y and z are the subset of the attributes of R

- Let *R* be a relation schema with a set of attributes that are partitioned into 3 nonempty subsets.

  Y, Z, W

- We say that $Y \rightarrow\!\!\!\!\rightarrow Z$ *(Y* multi determines *Z)* if and only if for all possible relations *r(R)*

  $< y_1, z_1, w_1 > \in r$ and $< y_2, z_2, w_2 > \in r$

  then

  $< y_1, z_1, w_2 > \in r$ and $< y_1, z_2, w_1 > \in r$

- Note that since the behavior of *Z* and *W* are identical it follows that $Y \rightarrow\!\!\!\!\rightarrow Z$ if $Y \rightarrow\!\!\!\!\rightarrow W$

(b) Explain 4NF. 7

4NF

Fourth normal form is required when undesirable multi valued dependencies occurs in a relation. A relation is in 4NF with respect to a set F of functional and multi valued dependencies if, for every non-trivial multi valued dependency X$\longrightarrow\!\!\!\!\blacktriangleright\!\!\blacktriangleright$ Y in F, where X ≤ R and Y ≤ R, X is a super key of R.

- $R = (A, B, C, G, H, I)$

  $F = \{ A \rightarrow\!\!\!\!\rightarrow B$

  $B \rightarrow\!\!\!\!\rightarrow HI$

  $CG \rightarrow\!\!\!\!\rightarrow H \}$

- *R* is not in 4NF since $A \rightarrow\!\!\!\!\rightarrow B$ and *A* is not a superkey for *R*

- Decomposition

  a) $R_1 = (A, B)$ (R_1 is in 4NF)

  b) $R_2 = (A, C, G, H, I)$ (R_2 is not in 4NF)

c) $R_3 = (C, G, H)$ (R_3 is in 4NF)

d) $R_4 = (A, C, G, I)$ (R_4 is not in 4NF)

- Since $A \rightarrow\rightarrow B$ and $B \rightarrow\rightarrow HI$, $A \rightarrow\rightarrow HI$, $A \rightarrow\rightarrow I$

e) $R_5 = (A, I)$ (R_5 is in 4NF)

f)R_6 = (A, C, G) (R_6 is in 4NF)

OR

VIII. (a) Explain lossless joint property and dependency prevention property. 10

Lossless joint property

It is to ensure that the original relations must be recovered from the smaller relations that result after decomposition.

Let R be a relation schema with a given set F of functional dependencies. Then decomposition on R is said to be lossless if for every relation the following holds.

$\pi_{R1}(R)$ R_2 (R) … $\pi_{Rn}(R) = R$

- For all possible relations *r* on schema *R*

  $r = \prod_{R1}(r)$ $\prod_{R2}(r)$

- To check if a dependency $\alpha \rightarrow \beta$ is preserved in a decomposition of R into R_1, R_2, …, R_n we apply the following simplified test (with attribute closure done w.r.t. F)
  - *result*=α
    while (changes to *result*) do
    for each R_i in the decomposition
    $t = (result \cap R_i)^+ \cap R_i$
    $result = result \cup t$
  - If *result* contains all attributes in β, then the functional dependency $\alpha \rightarrow \beta$ is preserved.
- We apply the test on all dependencies in F to check if a decomposition is dependency preserving
- This procedure takes polynomial time, instead of the exponential time required to compute F^+ and $(F_1 \cup F_2 \cup ... \cup F_n)^+$

(b) Explain INF with example. 5

A relation R is in INF if and only if the domain of all attributes of R contain atomic (or indivisible) values only.

- Consider the relation schema:
  Lending-schema = (branch-name, branch-city, assets, customer-name, loan-number, amount)

branch-name	*branch-city*	*assets*	*customer-name*	*loan-number*	*amount*
Downtown	Brooklyn	9000000	Jones	L-17	1000
Redwood	Palo Alto	2100000	Smith	L-23	2000
Perryridge	Horseneck	1700000	Hayes	L-15	1500
Downtown	Brooklyn	9000000	Jackson	L-14	1500

- Redundancy:
  - Data for *branch-name, branch-city,* assets are repeated for each loan that a branch makes
  - Wastes space
  - Complicates updating, introducing possibility of inconsistency of *assets* value
- Null values
  - Cannot store information about a branch if no loans exist
  - Can use null values, but they are difficult to handle.

Unit-IV

IX. **(a) Create a virtual relation named 'employee I' from the relation 'employee'. The relation 'employee I' and employee must have same number of tuples.** 5

A view is a virtual relation in a database.

EMPLOYEE (EMPNO< EMP NAME< DESG< DOJ)

EMPLOYEEI (EMP NO, EMP NAME)

EMPLOYEEI (EMP NO, DESG)

(b) Explain the different aggregate functions in SQL with examples. 7

AVG, MIN, MAX, SUM, COUNT

AVG()-returns the average value

COUNT()-returns the number of rows

FIRST()-returns the first value

LAST()-returns the last value

MAX()-returns the largest value

MIN()-returns the smallest value

SUM()-returns the sum

```
SELECT COUNT(DISTINCT deptno) FROM emp;

SELECT COUNT(*) FROM emp;

SELECT SUM(salary), AVG(comm) FROM emp;
```

(c) Define dynamic SQL. 3

Dynamic SQL

Dynamic SQL are generated at runtime and are passed to DBMS for processing. It can generate query also during run time.

OR

X. **(a) Explain ODBC and JDBC.**

ODBC

It provides an interface that the application programs can establish connection with the database. After establishing connection it can communicate through queries.

JDBC

It provides an interface that can access database through Java where connection is established with the help of DBMS specified driver.

(b) Explain constraints in SQL. Write a query to create a table 'student' with attribute (Reg. No., class, Age, Dept.) and add the constraint primary key to 'Reg. No.' attribute. **7**

Constraints in SQL

The constraints in SQL are

(i) Primary key constraint.

(ii) Check constraint

(iii) Unique constraint

(iv) NOT NULL constraint

(v) Foreign key constraint

CREATE TABLE <student>

(Reg. No VARCHAR (15),

Name VARCHAR (50),

Class VARVHAR (20),

Age NUMERIC (4),

Dept VARCHAR (10)

)

Reg No VARCHAR (15) PRIMARY KEY