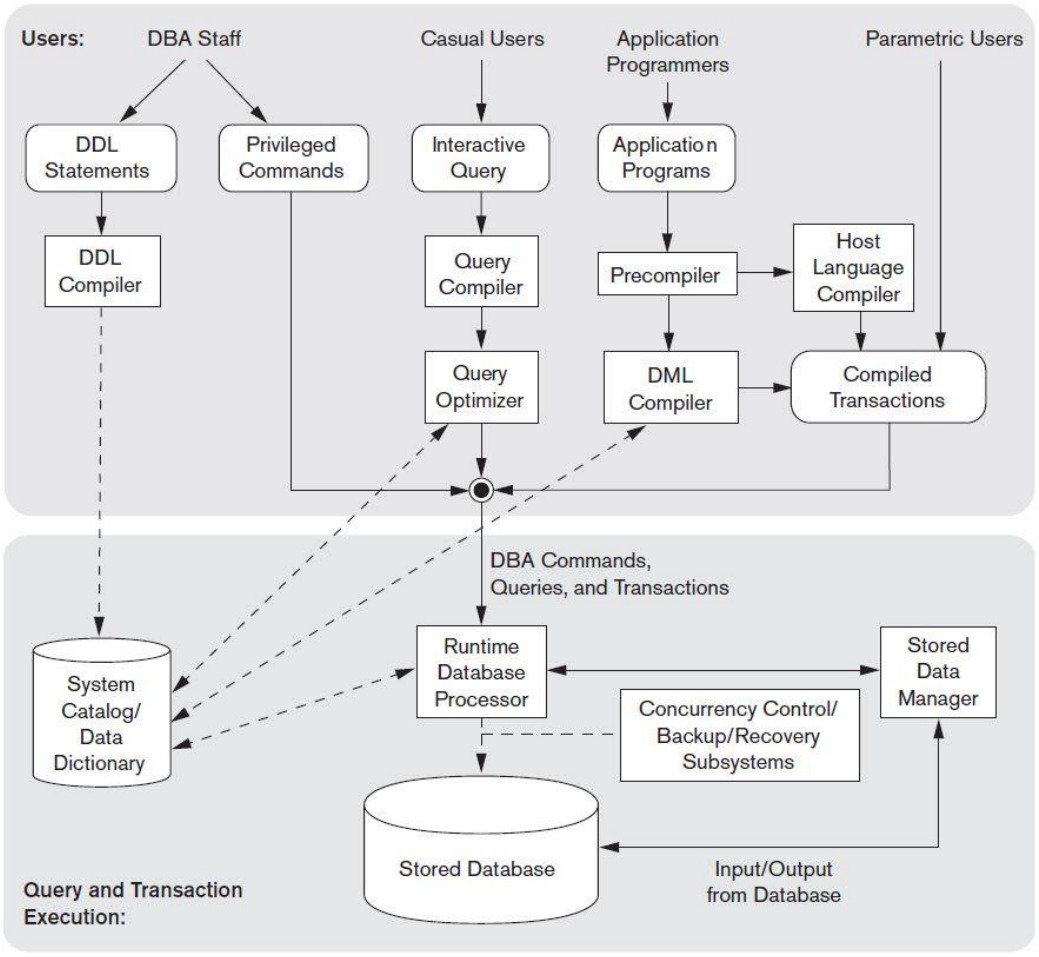
CAT - 1

Programme	:	**B.Tech**			
Course Title	:	**Database Management Systems**	Code	:	**CSE2007**
Time	:	**01:30 Hours**	Max. Marks	:	**50**

Part A- Answer all the Questions (5 x 10= 50 marks)

1.	Explain the types of software components that constitute a DBMS and the types of computer system software with which the DBMS interacts. Answer:  A Database system is partitioned into modules that deal with each of the responsibilities of the overall system. The functional components of a database system can be broadly divided into the storage manager and query processor components. Storage Manager	**10**

A 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 for the interaction with the file manager. The raw data are stored on the disk using the file system, which is usually provided by a conventional operating system. The storage manager translates the various DML statements into low level file system commands. Thus, the storage manager is responsible for storing, retrieving and updating data in the database.
The storage manager components include:

Authorization and integrity manager
Which tests for the satisfaction of integrity constraints and checks the authority of users to access data.

Transaction manager
Which ensures that the database remains in a consistent correct) state despite system failures, and that concurrent transaction executions proceed without conflicting.

File Manager
Which manages the allocation of space on disk storage and the data structures used to represent information stored on disk.

Buffer manager
Which is responsible for fetching data from disk storage into main memory, and deciding what data to cache in main memory. The buffer manager is a critical part of the database system, since it enables the database to handle data sizes that are much larger than the size of main memory.

The storage manager implements several data structures as part of the physical system implementation
Data files, which store the database itself.
Data dictionary, which stores metadata about the structure of the database, in particular the schema of the database.
Indices, which provide fast access to data items that hold particular values.

The Query Processor
The query processor components include
DDL interpreter, which interprets DDL statements and records the definitions in the data dictionary.
DML compiler, which translates DML statements in a query language into an evaluation plan consisting of low level instructions that the query evaluation engine understands.

A query can usually be translated into any of a number of alternative evaluation plans that all give the same result. The DML compiler also performs query

	optimization that is it picks the lowest cost evaluation plan from among the alternatives. Query evaluation engine, which executes low level instructions generated by the DML compiler.	
2.	Construct an ER model for the given scenario Consider a MAIL_ORDER database in which employees take orders for parts from customers. The data requirements are summarized as follows: • The mail order company has employees, each identified by a unique employee number, first and last name, and Zip Code. • Each customer of the company is identified by a unique customer number, first and last name, and Zip Code. • Each part sold by the company is identified by a unique part number, a part name, price, and quantity in stock. • Each order placed by a customer is taken by an employee and is given a unique order number. Each order contains specified quantities of one or more parts. Each order has a date of receipt as well as an expected ship date. The actual ship date is also recorded.	**10**
3.	Consider the relational database. • employee (person name, street, city) • works (person name, company name, salary) • company (company name, city) Give an expression in the Relational Algebra to express each of the following queries: a) Find the names of all employees who live in city “Miami”. b) Find the company name of all employees whose salary is greater than Rs. 10000. c) Find the names of all employees d) Find the city of all employees whose salary is greater than Rs. 10000 e) Find the street and city name of an employee “xxx” Answer:	**10**

a) $\Pi_{(person\ name)} \left(\sigma_{(city = "Miami")} (Employee) \right)$

b). $\Pi_{(company\ name)} \left(\sigma_{(salary > 10000)} (Works) \right)$

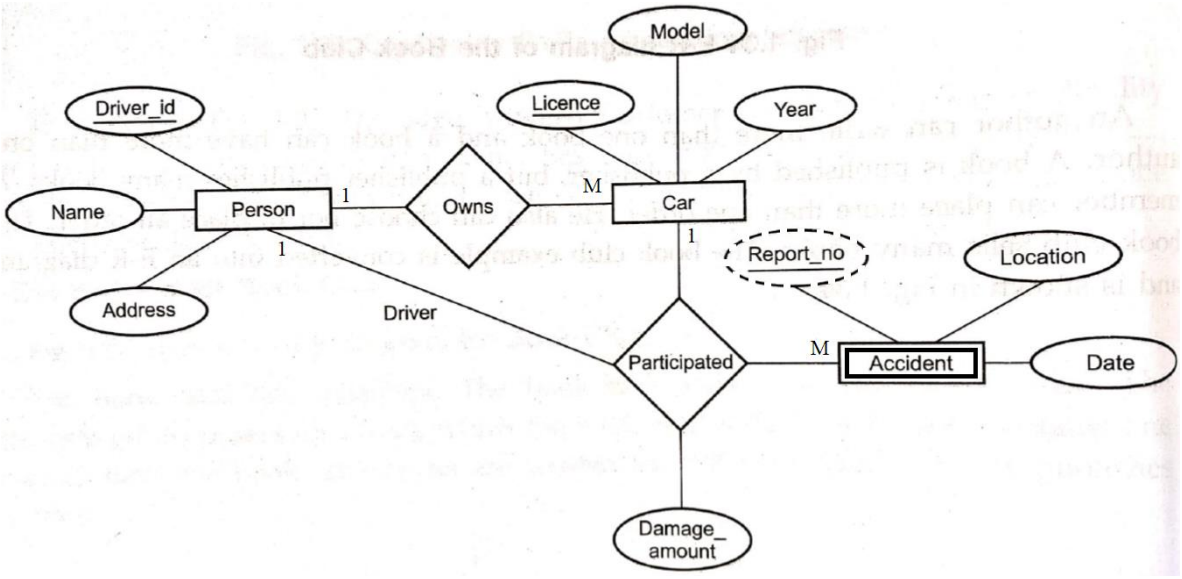
c) $\Pi_{(person\ name)} (Employee)$ (or)

$\Pi_{(person\ name)} (Works)$

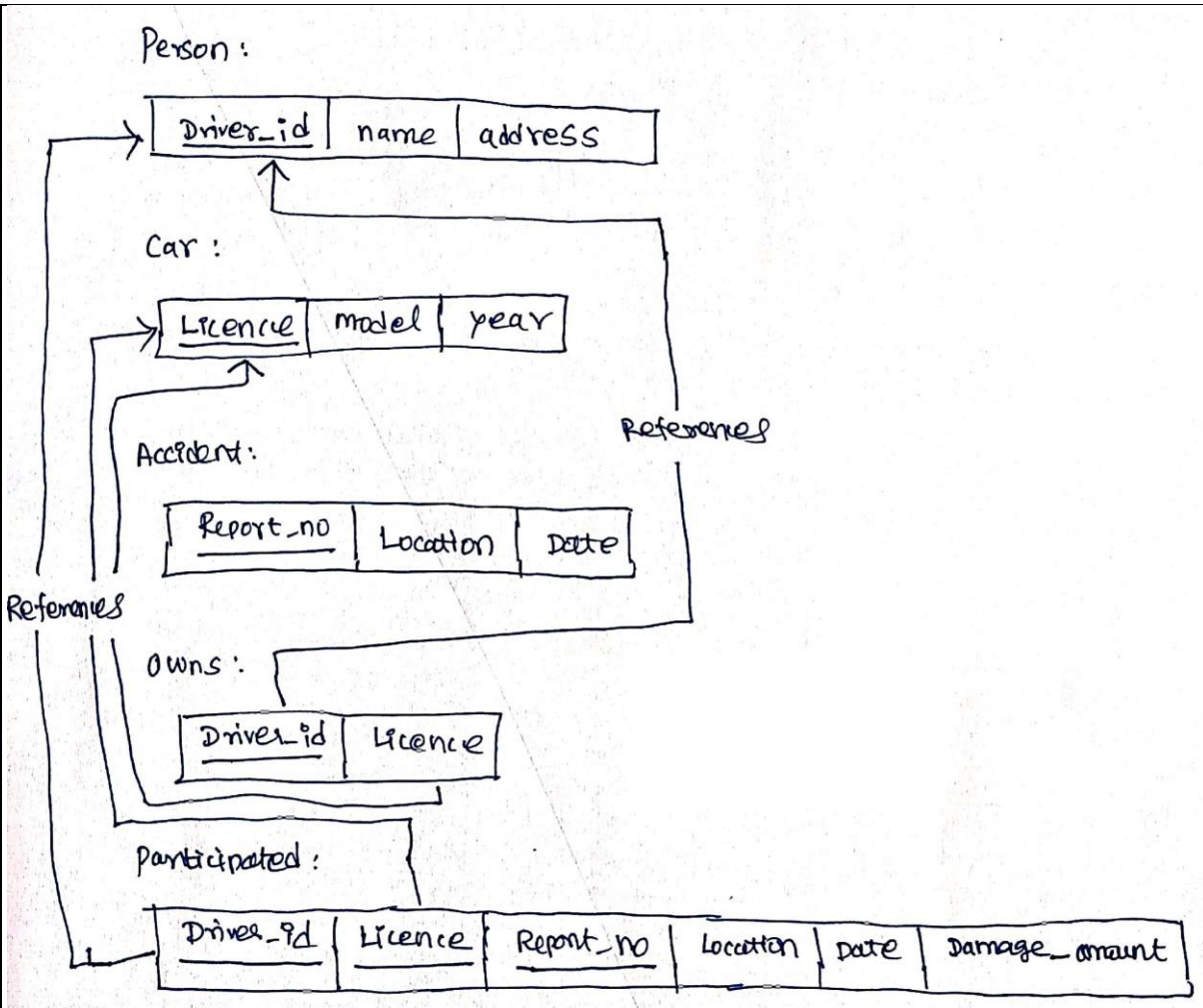
d) $\Pi_{(city)} \left[\left(\sigma_{(person\ name = \Pi_{(person\ name)} (\sigma_{(salary > 10000)} (works))} \right) \right] (Employee)$

e) $\Pi_{(street,\ city)} \left(\sigma_{(person\ name = "xxx")} (Employee) \right)$

4. Convert the following ER Diagram in to Relational model. **10**



Answer:



* Mentioning of datatypes (Domains) & Create Table Query is optional.

* Instead of schema, if the create query with datatype is represented full mark can be awarded.

5. Consider the following Relational models. **10**

Relation 1: Employee

Empl_ID (number(3))	F_Name (varchar(10))	L_Name (varchar(10))
37	Florence	Newyork
1234	David	Paris

Relation 2: Project

Project_ID (number(2))	Project_Name (varchar(20))
10	Online Market Research
20	Flight Booking

Relation 3: Employee_Project

Empl_ID (number(3))	Project_ID (number(2))	Assigned_Project_Task (varchar(20))
37	10	Project Management
1234	10	DB Development
1234	20	Lead Architect

Justify whether the following constraints has been followed or not in all the three relations given.

a) Domain constraints
b) Referential integrity
c) NULLs
d) Entity integrity
e) Enterprise constraints if the company size is between 10 to 100 employees

Answer:

f) Domain constraints
Domain constraint is violated at Employee relation at Empl_ID attribute in second tuple.
Domain constraint is violated at Project relation at Project_Name attribute in first tuple.
Domain constraint is violated at Employee_Project relation at Empl_ID attribute in second and third tuple.

g) Referential integrity
Referential integrity constraint is violated at Employee and Employee_Project relation at Empl_ID attribute in third tuple. (If they considered Empl_ID+Project_ID as primary key, Referential integrity is NOT violated)

h) NULLs
NULLs constraint is NOT violated at any relation

i) Entity integrity
Entity integrity constraint is violated in Employee_Project (But if the student identified the Primary key as Empl_ID+Project_ID, then Entity integrity constraint is NOT violated)

j) Enterprise constraints if the company size is between 10 to 100 employees
Enterprise constraints violated at Employee and Employee_Project relation. Empl_ID can not be more than 100.