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WINTER – 2018 EXAMINATION
MODEL ANSWER

Subject: Principles of Database **Subject Code:** 22321

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1.	**(A)**	**Attempt any FIVE of the following:**	**10**
	(a)	**Define the term Database Schema**	**2M**
	Ans.	The overall design of the database is called the database schema. A schema diagram displays only names of record types (entities) and names of data items (attributes) and does not show the relationships among the various files.	***Correct definition 2M***
	(b)	**List 4 types of Database languages.**	**2M**
	Ans	Four types of database languages are: 1. DDL (Data Definition Language) 2. DML (Data Manipulation Language) 3. DDL (Data Control Language) 4. TCL (Transaction control language)	***Each type ½ M***
	(c)	**Define the term Data Model.**	**2M**
	Ans	Underlying structure of the database is called as **data model**. It is a collection of conceptual tools for describing data, data relationships, data semantics and consistency constraints. Data models define how data is connected to each other and how they are processed and stored inside the system.	***Correct definition 2M***

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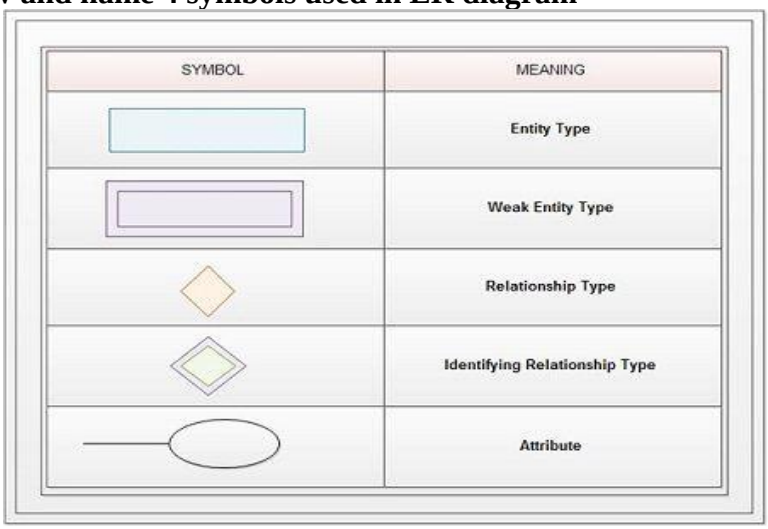
	(d) Ans	**Define the term Foreign Key.** A FOREIGN KEY is a key used to link two tables together. A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table. It acts as a cross-reference between tables because it references the primary **key** of another table, thereby establishing a link between them.	**2M** ***Correct definition 2M***
	(e) Ans	**Enlist components of database.** A database system involves four major components. 1. Data 2. Hardware 3. Software 4. Users	**2M** ***Each component ½ M***
	(f) Ans	**Draw and name 4 symbols used in ER diagram**  	**2M** ***Any four symbols ½ M each***

WINTER – 2018 EXAMINATION
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		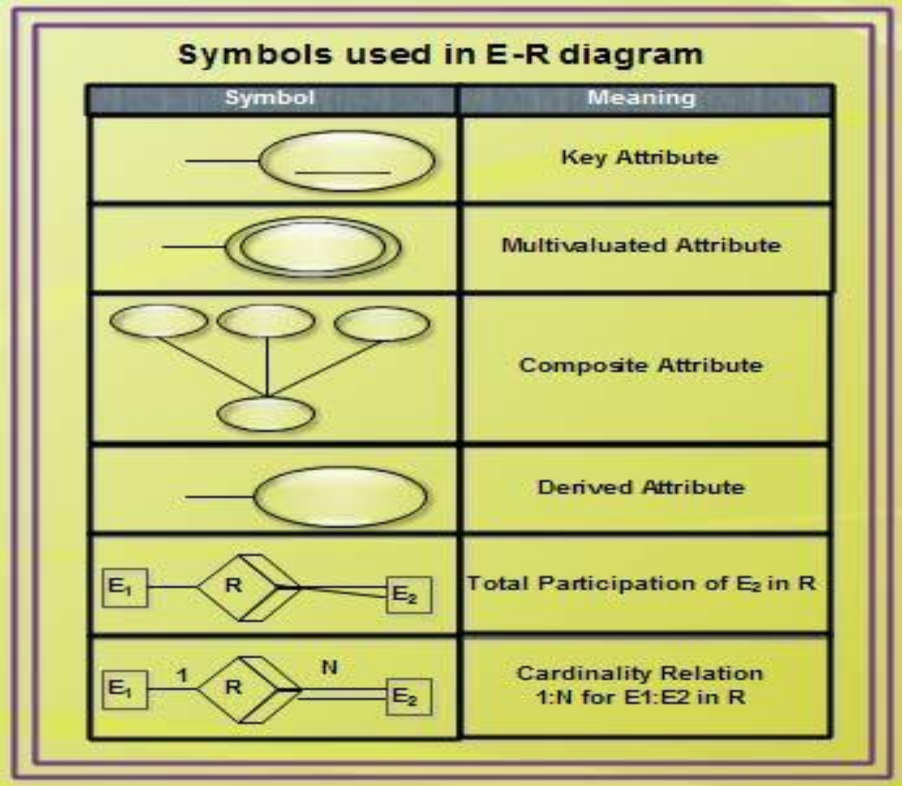	
	(g) Ans	**State any four characteristics of Database.** The Characteristics of Database are: 1. Persistent Data 2. Meta Data and Self-describing nature of a DB 3. Insulation between programs and data (Data Independence) 4. Support of multiple views of the data 5. Sharing of data and multiuser transaction processing 6. Access flexibility and Security. 7. Controlled Redundancy	**2M** ***Any four characteristics ½M each***

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2. (a) Ans — **Attempt any THREE of the following:** — **12**

Distinguish between file processing system and DBMS. — **4M**

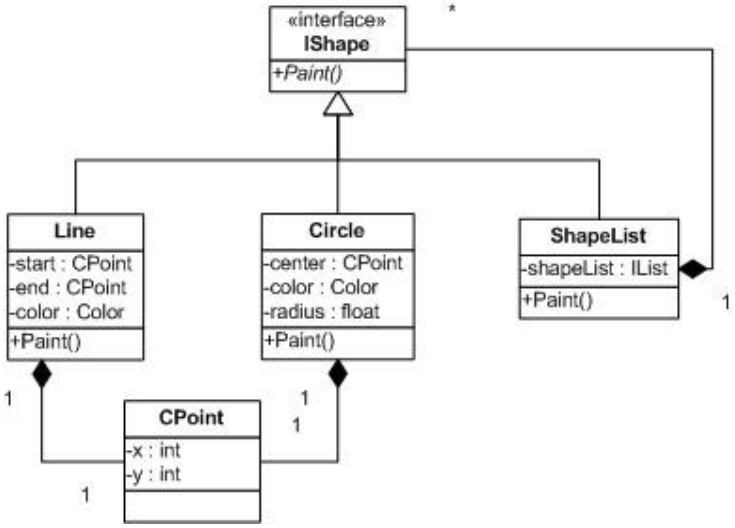
Any four points 1M each

Database Management system	File processing system
1. Presence of Self-describing nature of a database system and Metadata.	1. File processing don't contain any self describing feature and neither posses metadata.
2. In database system, the structure of data files is stored in the DBMS catalog separately from the access program. This is called program-data independence	2.In file processing system, if any changes to the structure of a file may require changing *all programs* that access the file
3. Support of multiple views of the data i.e Each user may see a different view of the database, which describes only the data of interest to that user	3.File processing system don't support multiple views.
4. Sharing of data and multi-user transaction processing i.e allowing a set of **concurrent users** to retrieve from and to update the database.	4.It is not possible to share data and multi user transaction simultaneously among concurrent users in case of file processing system
5. Controlling Redundancy is one of most important feature to use DBMS	5. The traditional file approach, each group independently keeps their own file.

(b) Ans — **Describe object-oriented data models.** — **4M**

Object Oriented Model

Object oriented models were introduced to overcome the shortcomings of conventional models like Relational, Hierarchical

		and network model. An object-oriented database is collection of objects whose behavior, state, and relationships are defined in accordance with object-oriented concepts (such as objects, class, class hierarchy etc.) In this both data and their relationship are organized or contained in a single structure known as **object.** Object includes information about relationship between the facts within the object, as well as information about relationship with other objects. **It is also said to be semantic data model.**  	***Description 2M*** ***Diagram 2M***
	(c) **Ans.**	**Construct an E-R diagram for a car insurance company whose customers own one or more cars. Assume suitable attributes.**	**4M**

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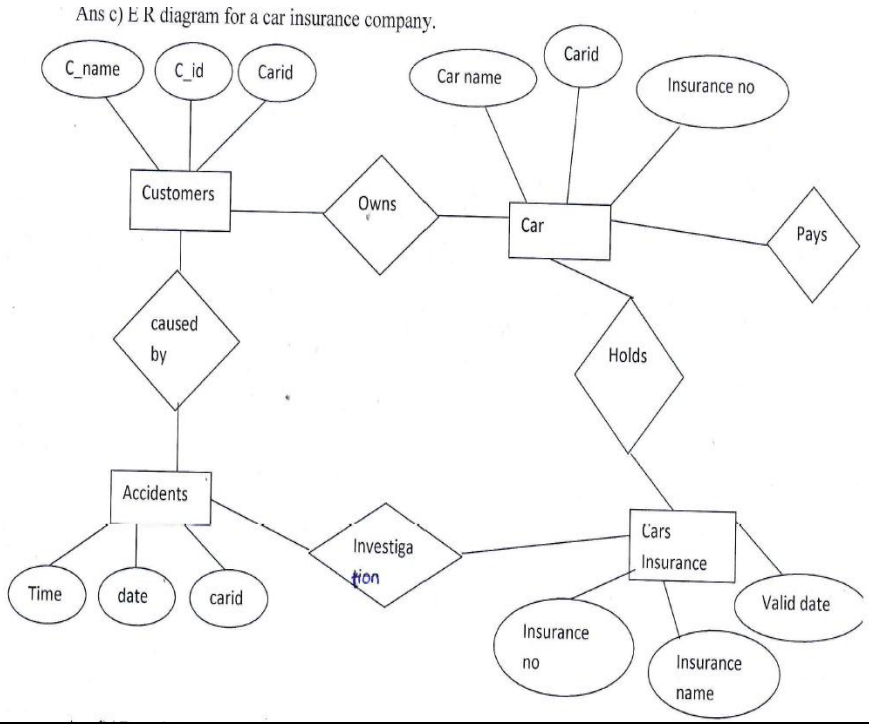
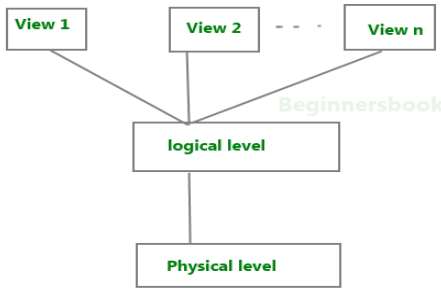
			***Use of correct entities 1 M*** ***Correct symbols 2M*** ***Correct relations hips 1M***
	(d)	**Describe the three levels of data abstraction with diagram.**	**4M**
	Ans	**Three levels of data abstraction are:** **Physical level**: This is the lowest level of data abstraction. It describes how data is actually stored in database. The complex data structure details is described at this level. **Logical level**: This is the middle level of 3-level data abstraction architecture. It describes what data is stored in database and the relationships among the data. **View level**: This is highest level of data abstraction. This level describes the user interaction with database system.	***Description 3M*** ***Diagram 1M***

		 Three Levels of data abstraction	
3	**(a) Ans**	**Attempt any THREE of the following:** **Explain Integrity constraints with example.** • **Not Null:** By default, all columns in tables allows null values. When a NOT NULL Constraint is enforced on column or set of columns it will not allow null values. **Example** SQL> CREATE TABLE STUDENT (ROLL_NO NUMBER (5), NAME VARCHAR2 (20) NOT NULL); • **Check Constraint**: The constraint defines a condition that each row must satisfy. A single Column can have multiple check condition. **Example** SQL> CREATE TABLE EMP (ID NUMBER (5), NAME VARCHAR2 (10), SAL NUMBER (10) CONSTRINT CHK_SAL CHECK (SAL>15000)); • **Primary Key constraint:** It is used to avoid redundant/duplicate value entry within the row of specified column in table. It restricts null values too. **Example** SQL> CREATE TABLE EMP (ID NUMBER (5) CONSTRAINT ID_PK PRIMARY KEY, NAME VARCHAR2 (10), SAL NUMBER (10)); • **Unique Constraint**: The UNIQUE constraint uniquely identifies each record in a database table. The UNIQUE and PRIMARY KEY constraints both provide a guarantee for uniqueness of a column or set of columns. It allows null value. **Example** CREATE TABLE PERSONS (P_ID NUMBER CONSTRAINT P_UK UNIQUE, FIRSTNAME VARCHAR2(20), CITY VARCHAR2(20));	**12** **4M** ***For any four integrity constrai nt 1M each***

		• **Referential Integrity Constraint**: It is a relational database concept in which multiple tables share a relationship based on the data stored in the tables, and that relationship must remain consistent. A value of foreign key is derived from primary key which is defined in parent table. **Example** CREATE TABLE DEPARTMENT (EMP_ID NUMBER(5) REFERENCESEMP(EMP_ID), DNO NUMBER(3));	
	(b) Ans	**Explain benefits and drawbacks of Denormalization.** Benefits of denormalization (consider any 2) • **Reduce number of relations** : It reduce the number of relations because it combines two relations into one new relation. • **Reduce number of foreign keys**-It reduce number of foreign keys because number of relations are reduced . • **Minimizes need for joins**-It minimizes need for joins because it combines many relations into one. • **Increase Performance -** It increase performance of database by adding redundant data or by grouping data. Drawbacks of demoralization.(consider any 2) • **Slow Data Updates-**It may speed up the retrieval but can slow down database updates • **Increase size of relations** -It can increase size of the relations due to combining multiple relations into one single relation. • **Complex implementation** -It may simplify implementation in some cases but may make it more complex in other. • **Application Specific** -It is always application-specific and needs to be re-evaluated if the application changes.	**4M** ***Any 2 Benefits 2M*** ***Any 2 Drawbacks 2M***
	(c) Ans	**Explain primary key and candidate key with example.** **Primary Key:** A primary key is an attribute in Relation that uniquely identifies the rows in relation. A Primary key does not hold NULL values and duplicate values. OR A key which is selected by the designer to uniquely identify the entity is called as Primary key. A primary key cannot contain duplicate values and it can never contain null values inside it. **Example:** In a Student table(Rollno , Name, Percentage) , **Rollno is the primary key**	**4M** ***Each term definition with example 2M***

		Candidate key In a relation there may be a key or combination of keys which uniquely identify the record. Such a key is called as Candidate key. **Example** : Consider a Student table (Rollno,Name,Percentage), if (**Rollno)** and(**Name)**both are unique then both are identified as candidate keys. OR Consider a Student table (Rollno,Name,Percentage), if (Rollno ,Name) is unique , then **(Rollno, Name)** can be a candidate key if and only if Name and Rollno individually are not unique.	
	(d) Ans	**Explain advantages of centralized and distributed databases.** **Advantage of Centralized databases (**consider any 2) • **Data integrity is maximized -**Data integrity is maximized and data redundancy is minimized because data is stored at a single place. • **Easier Database Administration** -It is easy for database administration because Centralized databases are easy to manage, maintain, update, backup etc. • **Cost effectiveness** – Cost will be less because, database is located ,stored and maintain at one central location • **Easy Modification, Access and Analysis** -Data kept in the same location which makes modification, access and analysis easy. **Advantage of Distributed databases (**consider any 2) • **Better Response** − If data is distributed in an efficient manner, then user requests can be met from local data itself, thus providing faster response • **More Reliable -** When the data and DBMS software are distributed over several sites one site may fail while other sites continue to operate ,which makes database more reliable • **Easier Expansion** - : Expansion can be easily achieved by adding processing and storage power to the existing network. • **Improved Performance** -These systems provide greater efficiency and better performance • **Resource Sharing -**Since data is distributed, a group of users can easily share and use data of different sites	**4M** ***Any two advantages of each type 2M***

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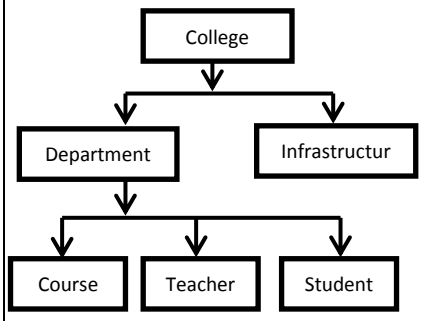
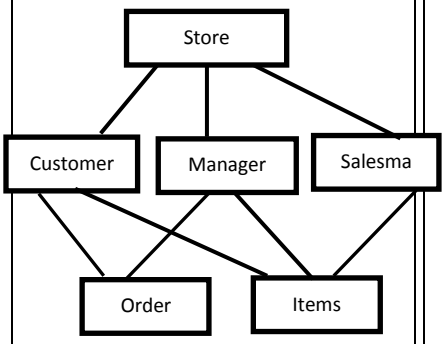
4	**(a) Ans**	**Attempt any THREE of the following:** **Describe the first normal form with its example** **First Normal Form (1NF)** • A relation is said to be 1NF if and only if every entry of the relation has at most a single (atomic) value. OR • A relation R is said to be in first normal form (1NF) if the domain of all attributes of R are atomic. • It does not allow multivalued attributes and composite attributes. **Example** Supplier (sno, sname, location, pno, qty) SNO | SNAME | LOCATION | PNO | QTY S1 | Abc | Mumbai | P1 | 200 S2 | Pqr | Pune | P2 | 300 S3 | Lmn | Delhi | P1 | 400 The above relation is in 1NF as all the domains are having atomic value. But it is not in 2NF.	**12** **4M** ***Description 2M*** ***Any relevant example 2M***

(b) Ans **Compare Hierarchical Database Model with Network Model.** **4M**

Sr No	Hierarchical Database Model	Network Model
1	Network Model represents tree like structure with one root.	Network Model represents tree like structure with many roots.
2	Reflects 1:N (One to many) relationship	Reflects M:N (Many to many) relationship
3	There can be only one node at the parent level	It allows a record to have more than one parent.
4	Example: 	Example : 
5	Relationship between records is of parent child type	Relationship between records is expressed in the form of pointers or links(Graphs).
6	Searching for a record is very difficult since one can retrieve a child only after going through its parent record.	Searching a record is easy since there are multiple access paths to a data element
7	There are multiple occurrences of child records, which lead to problem of inconsistency during the update operations	This model is free from update anomalies because there is only a single occurrence for each record set.
8	Record relationship implementation is simple due to the use of pointers	Record relationship implementation is complex due to the use of pointers

Any 4 differences 1M each

	(c) Ans	**Explain three level architecture of Database** There are following **three levels** or layers of DBMS **architecture**: • External Level : Describes part of the database that a particular user group is interested in. •Conceptual Level: Describes structure of the whole database for a community of users. • Internal Level : Describes physical storage structure of the database. **External Level or View level** It is the users' view of the database. This level describes that part of the database that is relevant to each user. External level is the one which is closest to the end users. This level deals with the way in which individual users view data. Individual users are given different views according to the user's requirement. **Conceptual Level or Logical level** It is the community view of the database. This level describes what data is stored in the database and the relationships among the data. The middle level in the three level architecture is the conceptual level. This level contains the logical structure of the entire database as seen by the DBA. It is a complete view of the data requirements of the organization that is independent of any storage considerations. The conceptual level represents all entities, their attributes, and their relationships. **Internal level or physical level** It is the physical representation of the database on the computer. This level describes how the data is stored in the database. The internal level is the one that concerns the way the data are physically stored on the hardware.	**4M** ***Explanation 2M***

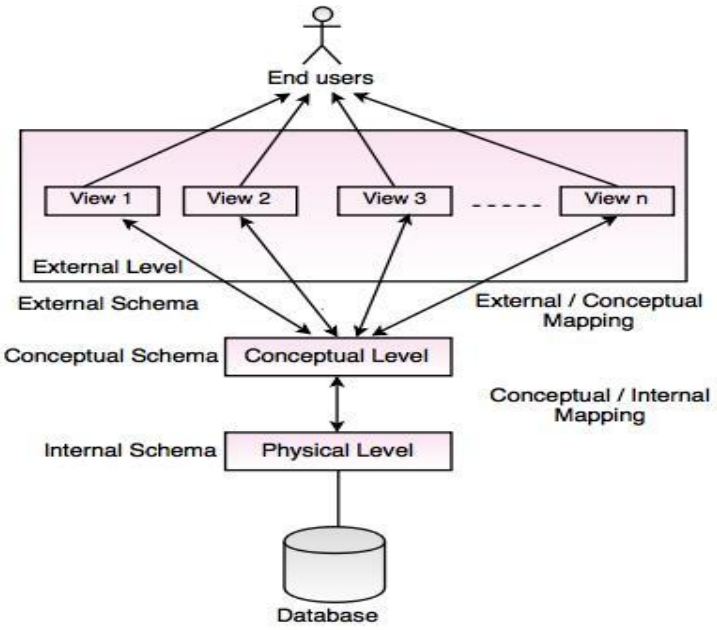


Fig. Three Level Architechture of DBMS

Diagram 2M

(d) Ans **Explain client / server database system.**

Note: Any other relevant diagram can be considered

4M

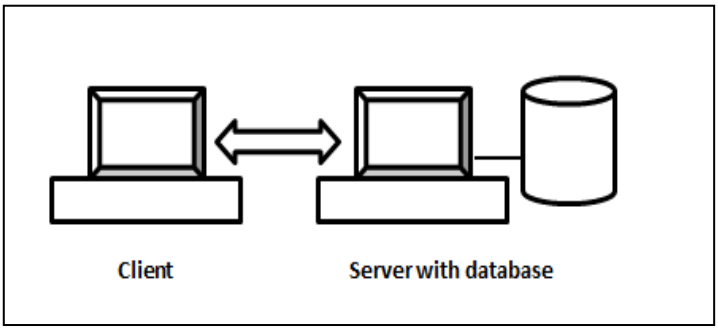


Figure : Client/ Server database System

Diagram 1M

It has two logical parts –client and server. The clients are the machines which requests for the service to the server. Server is the machine which serves to the clients. Applications and tools of DBMS run on client. DBMS software runs on server. Computer networking

Explanation 3M

		allows some task to be executed on a server system and some tasks on client system. This leads to development of client server architecture. There are different types of client/server architecture such as • Two tier architecture • Three tier architecture. In two tier architecture, client systems directly approach database servers whereas in three tie architecture, there exists a middle layer which acts as application server to receive and send requests from client machine to database server and vice versa.	
	(e) Ans	**Explain various types of Relational constraints.** **Relational Constraints** Relational constraints are a set of rules. It is used to maintain the quality of information. Integrity constraints ensure that the data insertion, updating, and other processes have to be performed in such a way that data integrity is not affected. Thus, integrity constraint is used to guard against accidental damage to the database. Types of Relational integrity Constraints are as follows 1. Domain constraints 2. Entity integrity constraints 3. Referential Integrity Constraints **Domain Constraint** - It is used to maintain value according to user specification For example: Not null, check constraint. **Entity integrity constraints** –it provides a way of ensuring that changes made to the database by authorized users do not result in a loss of data consistency. For example: Primary key, unique constraints **Referential Integrity Constraints** – It establishes parent child relationship between two tables. For example :Foreign key constraints	**4M** ***Explanation with any 4 constraints 1M each***

WINTER – 2018 EXAMINATION
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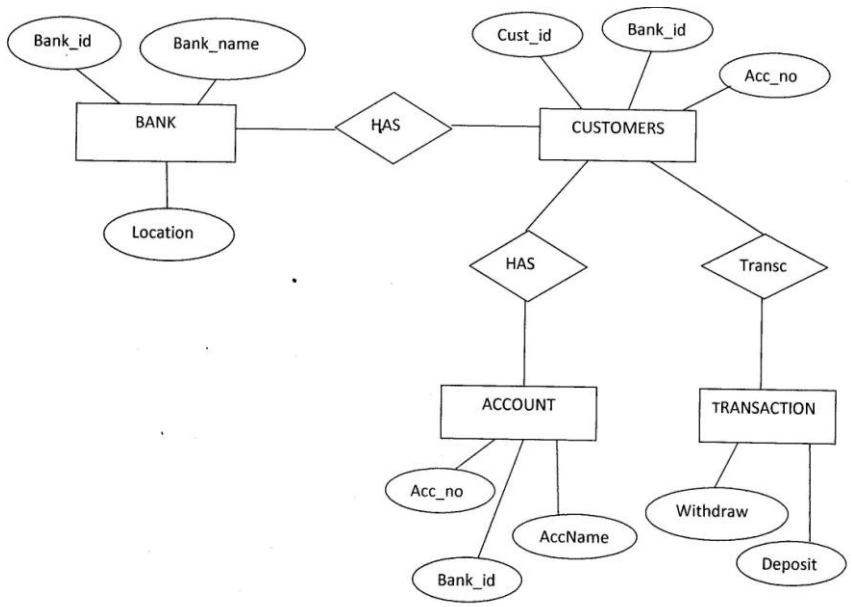
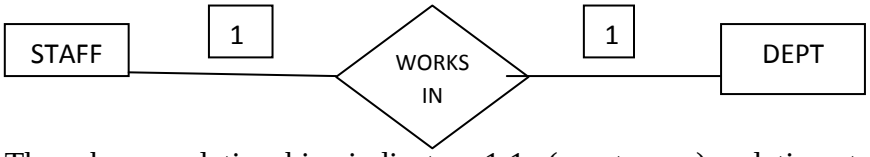
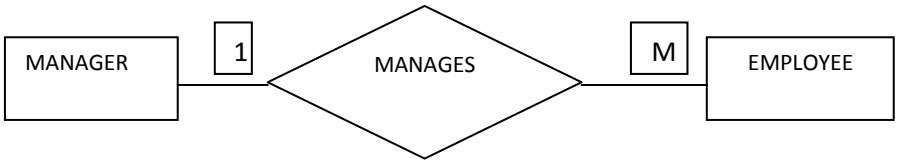
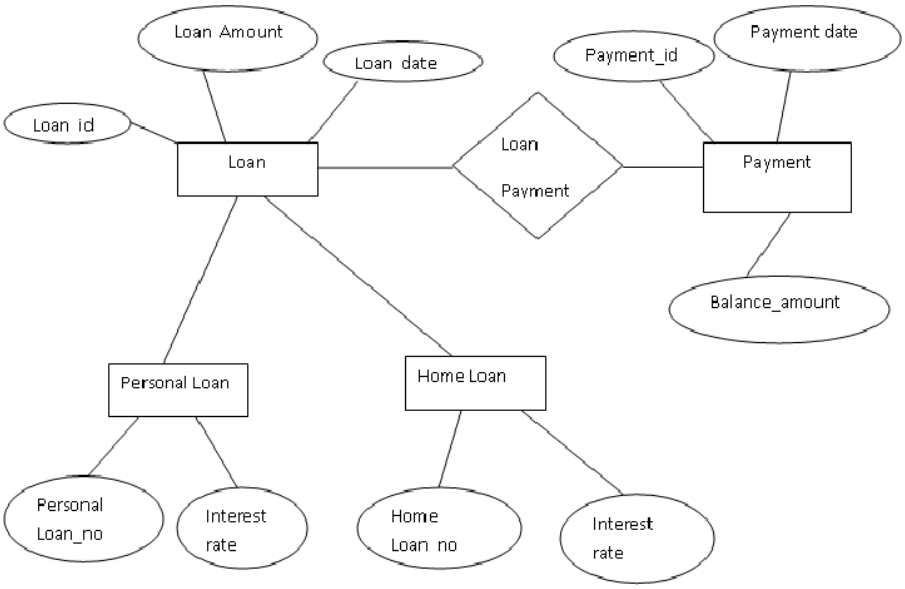
5		**Attempt ant TWO of the following**	**12**
	(a)	**Consider relation R with five attributes L, M, N, O, P.** **You have been given following dependencies** **L→M, MN→P, PO→L** **(i) List all keys for R.** **(ii) In what Normalized form R is? Justify your answer**	**6M**
	Ans	**(i) List all keys for R.** Since Right hand side does not have NO So (NO)+ =NO Now Combining NO with L,M,P we get Keys as LNO,MNO,PNO **(ii) In what Normalized form R is? Justify your answer** M,P,L are prime attributes, so R(L,M,N,O,P) is in 3NF.	***Each bit 3M***
	(b)	**Draw ER diagram for Banking system, to represent a customer has account scenario. Identify entities with their attributes and draw a diagram.**	**6M**

			***Use of correct entities 2M*** ***Correct symbols 2M*** ***Correct relations hips 2M***
	(c)	**Consider a single table consisting following columns. Convert it into 2NF and 3NF. Table (Supplier_no, Supplier_name, Supplier_city,. Order_no, Order_quantity, order_amount, product_name)**	**6M**
	Ans	Table 1 Schema given: (Supplier_no,Supplier Name,Supplier_city,Order_no,Order_quantity,Order_amount,Product_oduct name) **Step 1**.To convert It into 2NF, We have to decompose the given table into two tables with fully functional dependencies and establishing a referential integrity constraint relationship among the two tables. Table2: Supplier Details (Supplier_no,Supplier_name,Supplier_city,Order_no) Table 3:Order Details (Order_no, Order_ quantity, Order_amount, Product_code, product_name)	***Each conversion 3M***

		Now the above two tables are in 2NF **Step 2**: To convert the above tables in 3NF ,We have to decompose them in three tables satisfying the transitive dependencies property. Table 4: Supplier Details (Supplier_no,Supplier_name,Supplier_city) Table 5: Order Details ((Order_no, Order_ quantity, Order_amount) Table 6: Trasaction Details (Supplier_no, Order_no, Product_code, product_name) Hence the above three tables are satisfying Transitive dependencies Thus they are in 3NF.	
6	**(a)** **Ans**	**Attempt any TWO of the following :** **Consider 'student' database with appropriate details. Write a procedure to manipulate given database by adding, modifying and deleting records.** Let us consider a Schema for student database (Student_id,Student_name,Student_addr,Student_contact) 1.To add records into the given database , we have to use Insert into command. Syntax for inserting the values in the table is as follows: **SQL> Insert into <table name> values (value1, value2, value3…);** **Example:**SQL> Insert into student values(101,'Rajesh',Thane,9889923456); OR **Example:** **SQL> Insert into student values(&Student-id,'&Student_name','&Student_addr,'&Student_contact);**	**12** **6M** ***Each procedure 2M***

		2.To update records in given database, we have to use UPDATE command. **<u>The syntax of update command is:</u>** **Update<table name>set <columnname>=<expression>,<columnname>=<expression>;** **Example** **SQL> update student set Student_addr= 'Borivili';** 3.To delete records from the database, we have to use DELETE command. **<u>Syntax:-</u>** **Delete from <table name> where <condition>;** **Example:** Delete from student where Student_ addr='Thane'; 1 row deleted	
	(b) **Ans**	**For each of following relationship indicate type of relationship (1:1, 1:m, m:m)** **(i) Works in (a relationship between entities dept. and staff)** **(ii) Managers (a relationship between entities employee and Manager)** ***Note: Considering Managers in relationship as Manages*** **i) Works in(a relationship between entities dept and staff)** Diagram:  The above relationship indicates 1:1 (one-to-one) relation type because one staff can work in one department only at a given period.	**6M** ***Each bit explanation with diagram 3M***

		ii) Managers(a relationship between entities employee and manager) Diagram:  The above relationship indicates 1:m(one-to-many) relation type because one manager can manage many employees in a department.	
	(c) **Ans**	**Draw Enhanced ER diagram for loan payment system. Consider following entities:** **(i) Loan (Loan_id, Loan_amount, Loan_date)** **(ii) Payment (Payment_id, Payment_date, Balance_amount)** **(iii) Personal Loan (Personal Loan_no, Interest rate)** **(iv) Home Loan (Home loan_no, Interest rate)** **Show strong entity set, weak entity set, super class and sub class.**  	**6M** ***Use of correct entities 1 M*** ***Correct symbols 1M*** ***Correct relationships 1M*** ***Explanation 3M***

		1. All the above given entities contains a primary key attribute. So all the entities are Strong entity sets. **Example**: Loan_id is a primary key attribute present in loan entity. 2. There is absence of weak entity sets since all the entities contain a primary key attribute. 3 .Loan is a super class present in the above EER diagram. 4. Personal Loan and Home Loan are the sub classes present above.	