This question paper contains **8** printed pages]

Roll No. ☐☐☐☐☐☐☐☐☐☐☐

S. No. of Question Paper : **6074**

Unique Paper Code : **234305**   **D**

Name of the Paper : **Database Systems (CSHT-307)**

Name of the Course : **B.Sc. (H) Computer Science**

Semester : **III**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory. Attempt all parts together.

Attempt any *four* questions from section B.

All questions in section B carry equal marks.

Section A

All parts are compulsory.

1. (*a*) Differentiate between the following :   2×4

    (*i*) Database and DBMS

    (*ii*) Specialization lattice and Specialization hierarchy

    (*iii*) Entity type and Entity set

    (*iv*) Centralized and Distributed DBMS

P.T.O.

(*b*)   Explain the meaning of notation A + in XML document.   2

(*c*)   Consider a MUSICAL COMPANY database in which data is recorded about the music industry. The data requirements are as follows :

(*i*)   Each musician has an SSN, a name, an address and a phone number.

(*ii*)   Each instrument that is used in the songs has a name and a musical key.

(*iii*)   Each album that is recorded on the company label has a title, a copyright date, a format and an album identifier.

(*iv*)   Each song recorded at the company has a title and an author.

(*v*)   Each musician may play several instruments and serveral musician may play a given instrument.

(*vi*)   Each album has a number of songs on it but no song may appear in more than one album.

(*vii*)   One or more musician perform each song and a musician may perform in a number of songs.

(*viii*) Each album has exactly one musician who acts as its producer. A musician may produce several albums.

Design an ER diagram for the above specifications and indicate all keys and cardinality constraints. Also state any assumptions that are made.   8

(d) Give SQL commands to create the following tables with the given constraints.   5

DEPARTMENT

Field	Data-Type	NULL	Key	Default
Dno	int	No	Primary Key	Nil
Dname	Varchar(20)	Yes		Nil
Dlocation	Varchar(25)	Yes		'Chandigarh'

EMPLOYEE

Field	Data-Type	NULL	Key	Default
UID	Char(12)	No	PRIMARY	Nil
ename	Varchar(25)	no		Nil
Hire-date	date	no		Nil
Manager	Char(12)	yes	Foreign Key	Nil
Dno	Int	Yes	Foreign Key	10
salary	Decimal(10,2)	No		Nil

(e) Find the output of the following expressions by using the DIVISION operator in relational algebra on the tables A, B1, B2, B3 as given :   2×3

(i)   A/B1

P.T.O.

(4)   6074

(ii) A/B2

(iii) A/B3

S.No.	P.No.
S1	P1
S1	P2
S1	P3
S1	P4
S2	P1
S2	P2
S3	P2
S4	P2
S4	P4

A =

B1 =

P.No.
P2

B2 =

P.No.
P2
P4

B3 =

P.No.
P1
P2
P4

(f) Consider a relation R(A, B, C, D, E, F, G, H, I, J) and the set of functional dependencies

$$F = \{AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ\}.$$

What is the key of R ? Decompose R into 2NF and then 3NF relations.   2+4

Section B

Attempt any *four* questions :

2.   (a) Define the Entity Integrity and Referential Integrity constraints. Why are they considered

important ?   2+2

(b) Map the ER diagram given in Figure 1 to relational database. Cardinality constraints are given as follows : 6

(i) BANK and BANK-BRANCH (1 : N)

(ii) BANK-BRANCH and ACCOUNT (1 : N)

(iii) BANK-BRANCH and LOAN (1 : N)

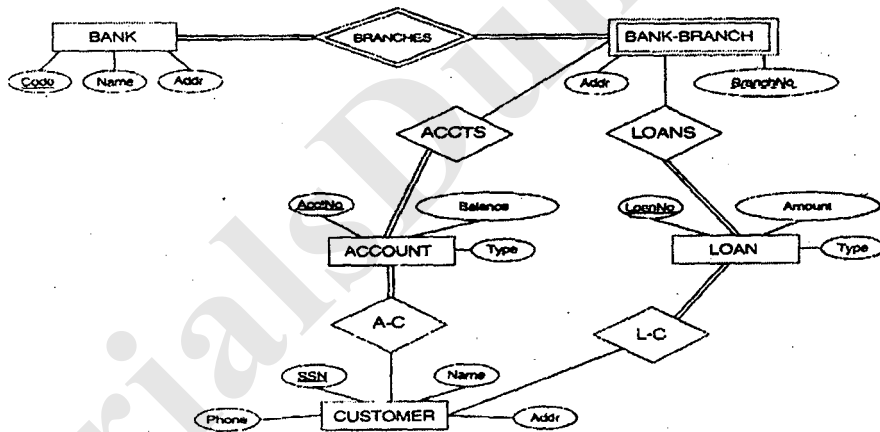(iv) LOAN and CUSTOMER (M : N)

(v) ACCOUNT and CUSTOMER (M : N)

Figure 1

3. (a) Consider the ER diagram in Figure 2. Assume that an employee may work in up to

two departments or may not be assigned o any department. Assume that each department

P.T.O.

must have one and may have up to three phone numbers. Supply (min, max) constraints on this diagram. State clearly any additional assumptions you make.   4
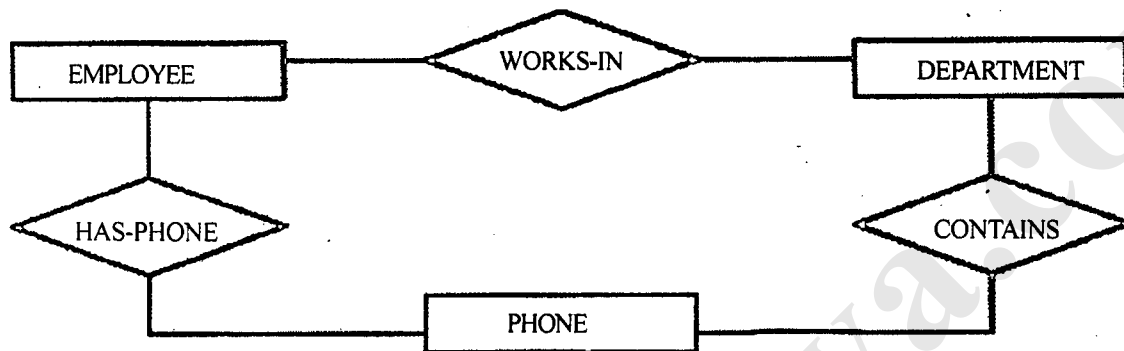

Figure 2

(b) Given below are two sets F and G of FDs for a relation R(A,B, C, D, E). Are they equivalent ? Justify your answer.

$$F = \{A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E\}$$ 6

$$G = \{A \rightarrow BC, D \rightarrow AE\}$$

4. (a) Consider a database that consists of the following relations :

SUPPLIER (Sno, Sname)

PART (Pno, Pname)

PROJECT (Jno, Jname)

SUPPLY (Sno, Pno, Jno)

Solve the following queries in SQL :   2×3

(i) Retrieve the project names (Jname) to whom supplier S1 supplies part P2.

    (ii)   Retrieve the total no. of parts supplied by each supplier.

    (iii) Retrieve a list of project names.

  (b) Differentiate between shared subclass and category with example.   2+2

5. *(a)* Explain the lost update problem, the dirty read problem and the incorrect summary problem with examples.   2×3

  (b) What are the three main types of XML documents ? Explain   3

  (c) What do you mean by commit point of a transaction ?   1

6. *(a)* Give one example each of the following :   6

    (i)   Recursive relationship

    (ii)   Identifying relationship

    (iii) Total and disjoint specialization.

  (b) How is OUTER UNION operation different from UNION operation ? Explain with example.   4

7. *(a)* Explain update anomalies in a relation due to bad design with the help of an example ? Why do they occur ?   4

  (b) What will be the result of the following relational algebra queries on the relations M and N given below :   1.5×4

    (i)   M Join N where M.X = N.P

    (ii) M Right Outer Join N where M.Y = N.Q

(iii) M Full outer Join N where M.X = N.P AND M.Y = N.Q

(iv) M Union N

M

X	Y	Z
5	3	6
10	7	9
5	2	7

N

P	Q	R
5	10	6
10	7	12
15	2	7

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