[This question paper contains 10 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2291 **IC**

Unique Paper Code : 42341202

Name of the Paper : Database Management Systems

Name of the Course : **B.Sc. (Prog.) / Math. Science**

Semester : II

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question **1** is compulsory.
3. Answer any five questions out of remaining questions **(Q2-Q8)**.
4. Answer **all** parts of a question together.

1. (a) What is data redundancy? What are the disadvantages of having redundancy within a database? (2)

(b) What is meant by degree of a relationship type? (2)

P.T.O.

(c) From the tables **R** and **S**, find the following :

(i) R U S (1)

(ii) S – R (1)

(iii) Cartesian Product of R and S (2)

R

Sno	Dept
S1	Phy
S2	Psy
S3	Chem
S4	Jour

S

Sno	Dept
S10	Maths1
S3	Chem
S15	Eng
S16	Maths2

(d) Given the following table and its associated functional dependencies. (3)

Emp_proj

Emp_id	Project_id	Hours	Emp_name	Proj_name

Emp_id →Emp_name
Proj_id → Project_id
Emp_id,Proj_id →Hours

What is the highest normal form that the relation **Emp_proj** satisfies? Justify your answer.

(e) Give an example for each of the following : (2)

(i) Total participation

(ii) Recursive relationship

(f) Illustrate with the help of an example an anomaly that might arise if referential integrity constraint is not satisfied in a relational schema? (2)

(g) Consider the following table TABLE 1: (2)

TABLE 1

X	Y	Z
2	3	1
3	4	2
4	5	3
5	6	4
6	7	1
2	3	1

Which of the following functional dependency constraints do not hold in the table TABLE1?

(i) $YZ \rightarrow X$

(ii) $X \rightarrow Z$

(iii) $X \rightarrow Y$

(iv) $Z \rightarrow X$

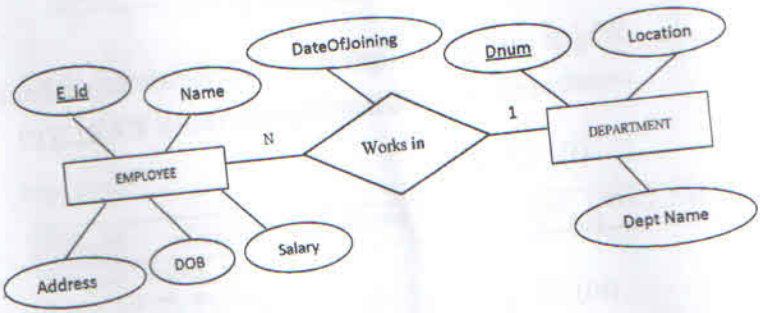
(h) What is Cardinality ratio? For the binary relationships below suggest cardinality ratios based on the meaning of the Entity types. State any assumptions you make. (3)

ENTITY 1	Cardinality Ratio	ENTITY 2
STUDENT	_____	TEACHER
COUNTRY	_____	CURRENT_PRESIDENT
ITEM	_____	ORDER

(in an order)

(i) What enhancements distinguish the EER model from the ER model? (2)

(j) Identify the tables needed to store the following model. You should not introduce tables unnecessarily. (3)



2. (a) What do you mean by the following terms? (4)

(i) Database catalog

(ii) Meta data

(b) What are the responsibilities of a database administrator? (2)

(c) Describe the 3-schema architecture. Why do we need mappings between schema levels? (4)

3. A University registrar's office maintains a database about the students having the following entities : (10)

- o courses, including number, title, credits, syllabus and prerequisites;
- o course offerings, including course number, year, semester, section number, instructor(s), timings and classroom;
- o students, including student-id, name and program;
- o instructors, including identification number, name, department, and title.

Further, for each student's enrollment in courses and grades awarded in each course in which the student is enrolled must be appropriately modeled.

(i) Identify the entities of interest.

(ii) Identify essential attributes associated with each entity with primary attributes marked.

(iii) Construct an E-R diagram for the registrar's office. State all assumptions that you make about the mapping constraints.

4. (a) Consider the following relational schema : (6)

```
Employee (eno,ename,dnum,dob,salary,street,city)
Works for (eno, proj no, hrs)
Department (dname, dno, mgr_no)
```

Give the following queries in relational algebra :

(i) Retrieve the name and address of all employees who work for **Research** department

(ii) Find the employee names who are either working in department no 4 and earn over 25,000 or are in department no 5 and earn over 30,000.

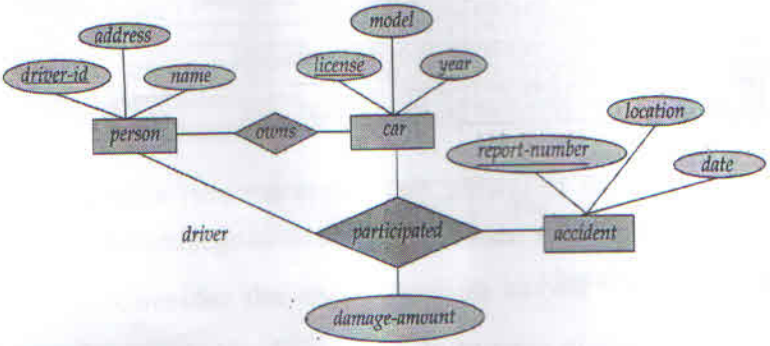
(iii) Find the names and salary of all managers.

(b) Differentiate between the following : (4)

(i) single valued attributes and multivalued attributes

(ii) intension and extension

5. (a) Given below is the ER diagram which models the **Car Insurance System**. Map the diagram into relational schema. Specify the primary key and foreign key. (6)



ER Diagram for the **Car Insurance System**

(b) Consider a relation **R(A,B,C,D)** with the following functional dependencies. (4)

$$AB \rightarrow C$$

$$CD \rightarrow E$$

$$DE \rightarrow B$$

Find out the candidate key for the above dependencies.

6. (a) Consider the following table : (5)

EMP_DEPT(EId, Ename, bdate, address, dnumber, dname, mgrssn)

EId	Ename	Bdate	Address	dnumber	dname	Mgrssn
E101	Ajay	10/02/1980	H-123,Janakpuri	D1	Sales	E106
E104	Swati	05/07/1974	A-5, Rani Bagh	D2	HR	E112
E105	Riya	12/10/1982	F-19,kirti Nagar	D5	IT	E105
E106	Deepak	07/07/1970	A-66, Pitampura	D1	Sales	E106
E112	Amit	15/03/1972	GH-34, PVihar	D3	Admin	E112
E110	Deepti	06/05/1985	A1-23, Janakpuri	D5	IT	E105

If the following operations are performed, check if one or more of the following constraints are violated :

domain constraint, key constraint, entity integrity constraint

(i) Insert a tuple ('E106', 'Supriya', '01/01/1992', 'X-22, Vasant Kunj', D5, 'IT', 'E105') into the **EMP_DEPT** table.

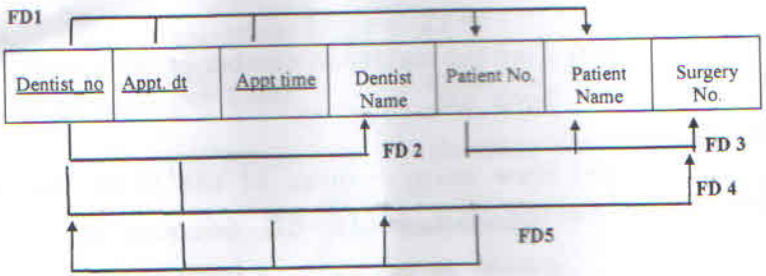
(ii) Insert a tuple ('E122', 'Rama', '11/07/1989', 'MM-122, Kalu Saray', D1, 'Sales', 'E106') into the **EMP_DEPT** table.

(iii) Insert a tuple (NULL, 'Zaheer', '11/02/1995', 'AA-98, 'Rajpur Road'sant Kunj', D5, 'IT', 'E105') into the **EMP_DEPT** table

(b) Using diagrams give an examples illustrating the following concepts.

specialization hierarchy and specialization lattice. (5)

7. (a) (8)



Consider the above relation having the depicted functional dependencies.

Apply normalization successively till 3NF. State the reasons behind each decomposition.

(b) Prove that a relation schema R(A, B) with two attributes is always in BCNF. (2)

8. (a) Consider the following schema about a library system having several branches.

```
BOOK ( BookId , Title , PublisherName )
BOOK_COPIES ( BookId, BranchId , NoOfCopies)
LIBRARY_BRANCH ( BranchId, BranchName , Address )
BOOK_AUTHORS (BookId , AuthorName)
BOOK_LOANS(BookId,BranchId,CardNo,DateIssue,DueDate)
BORROWER ( CardNo, Name, phone , Address )
```

Write the following queries in SQL : (2×5=10)

(i) List the title of books issued to **'Ramesh'**.

P.T.O.

(ii) Change the Publisher Name of BookId B10 to **'BPB'**.

(iii) Find the maximum number of copies that a book has.

(iv) How many copies of the book titled **'Fundamentals of Accounting'** are owned by each library branch?

(v) Give the list of book titles, branch-wise.