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Sno	Dept.
S1	Phyl
S2	Psy
S3	Chem
S4	Jour

S

Sno	Department	Floor
S10	Maths1	4
S3	Chem	3
S15	Eng	1
S4	Jour	1

- i. $S \times R$
 ii. $R \cup S$
 iii. $S - R$
 iv. $R \cap S$
 v. $R \bowtie S$ where $R.Sno = S.Sno$

- (ii) In each of the following binary relations, suggest the cardinality ratio between Entity 1 and Entity 2. Justify your answer, stating any assumptions you make. (5)

Entity 1	Cardinality Ratio	Entity 2
Manager		Department
Student		Teacher
Owner		Vehicle
Faculty		Department
Employee		Project

(1500)

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3028

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Unique Paper Code : 2344002001

Name of the Paper : Database Management Systems

Name of the Course : Computer Science Generic Elective (NEP-UGCF-2022 GE)

Semester : III

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

- Write your Roll. No. on the top immediately on receipt of this question paper.
- The paper has two sections. Section A is compulsory.
- Attempt any four questions from Section B.
- Parts of the question must be answered together.

P.T.O.

Section A

1. (i) Identify the multivalued and composite attributes from the following complex attribute:

Person_hobby (Name (First name, Last_name),
Phone (Area_code, Phone_No), {Hobbies}) (3)

- (ii) From the given SQL commands, identify whether it is DML, DDL or VDL.

(a) CREATE TABLE

(b) SELECT

(c) INSERT

(d) DELETE

(e) ALTER TABLE

(f) CREATE VIEW (3)

- (iii) Can the primary key of a relation be NULL?
Justify your answer. (3)

- (iv) Consider the following relation: (3)

The primary keys are underlined in the schema:

(7)

BOOKS (Bid, Title, Publisher, Year)

STUDENTS (Stid, StName, Major, Age)

AUTHORS (AName, Bookid, Address)

- (i) List the Year and Title of each book.

- (ii) List all information about students whose Major is 'CS'.

- (iii) List all books published by 'McGraw-Hill' before 1990.

- (iv) List the names of those authors who are living in 'Davis'.

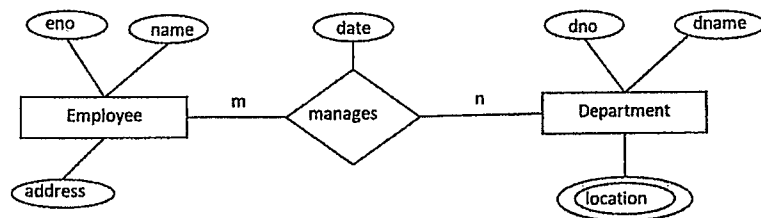
7. (i) Consider the following relations R and S. Show the result of the following operations: (10)

Compute the value of W after the given schedule is executed. Is this value of W correct? If the transactions (T1, T2) are not interleaved what would be the value of w?

6. (i) Consider the following ER diagram. (8)

(i) Map the given diagram into the relational schema

(ii) Specify the primary key and foreign key for each relation.



(ii) Use the following schema to write relational algebra statements for the questions that follow.

A	B	C
a1	b1	c1
a1	b1	c2
a2	b1	c1
a2	b1	c3

For the given relational state, do the following functional dependencies hold? Justify your answer.

(a) $A \rightarrow B$

(b) $A \rightarrow C$

(c) $B \rightarrow A$

(v) Consider the following relation schema: (3)

Product

<u>Prod_id</u>	Prod_Name	Price	Stock_in_ hand	Date_of_m fr
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From the Product table above, create a view that selects the name of the product and the Price of every product with a price higher than 1000. Name the view as Product_higher.

(vi) Define the following: (3)

(a) Domain

(b) Attribute

(c) Entity

(vii) For the given relation schema: R (A, B, C) and S (D, E, F), write relational algebra expressions that are equivalent to the following SQL queries:

(3)

(a) Select * from R where B = 20;

(b) Select A, E from R, S;

(viii) Is the Index file created using the primary index an ordered file? Name the fields of the primary index file. On which field of the data file is the primary index created? (3)

report number, reader_id, book_id, return date and issue date.

(a) Identify the cardinality ratio and participation constraints.

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

(c) Construct an ER diagram for the college library database with the above specifications. Also, state any assumptions that are made.

(ii) Consider the following two interleaved transactions (T1, T2) executed concurrently. Assume that the initial value of variable W is 10. (5)

T1	T2
	1. read(W);
	2. W:=W-2;
3. read(W);	
4. W:=W-3;	
	5. write(W);
6. write(W);	

(b) Add a new column No of Hours in the table ASSIGNED TO.

5. (i) Consider a College Library database that maintains the data about the books, readers and its staff members. The following are data requirements: (10)

- Staff members are described as name, staff_id, password.
- Book is described by book_id, book title, price, category, edition, and author name. Books are maintained by the staff member.
- Readers are registered with their reader_id, email, name (first name, last name), address, and phone number. A reader can have multiple phone numbers.
- Readers can return/reserve books that have an issue date and return date. A reader can reserve multiple books and one book can be reserved by only one reader. Staff members keep track of all the readers.
- Staff members also generate multiple reports about books and readers. Each report has a

(ix) Consider the following database, which records various products and their sales in the given two relations. (3)

Sales

S_id	Prod_id	Qty	Sale_dt	Total_price
1	106	2	2024-05-01	3000
2	102	3	2024-05-03	9000
3	103	2	2024-05-07	5000
4	104	4	2024-06-03	2000
5	105	6	2024-06-20	12000

Product

Prod_id	P_name	Category	Unit_Price
101	Glucometer	Healthcare	1500
102	Headphones	Electronics	3000
103	Keyboard	Electronics	2500
104	Mouse	Electronics	500
105	BP Monitor	Healthcare	2000

Give the result for each of the following SQL queries, when executed on the above two relations.

(i) SELECT *

FROM Sales

WHERE Qty > (SELECT AVG (Qty) FROM
Sales);

(ii) SELECT Category, COUNT (*), AVG
(Unit_Price)

FROM Product

GROUP BY Category;

- (x) What are the three reasons that lead to NULL values in a relation? Explain each with the help of an example. (3)

Section B

2. (i) Consider the following relational database schema that keeps the grade record of students. Following are two tables STUDENT and GRADE_REPORT. (10)

Write the SQL queries for the following:

- (a) Find the names of movies that are of type 'Action' or 'Comedy'.
- (b) Count the number of movies in each movie type.
- (c) Determine the maximum and minimum movie prices. Rename the columns as max_price and min_price respectively.
- (d) Find the name of all customers having 'a' as the second letter in their Fname.
- (e) Find the mv no which has been issued to 'Radhika'.

- (ii) Consider the following schema: (5)

PROJECT (Proj_no, Proj_name, Architect)

EMPLOYEE (Emp_no, E_name)

ASSIGNED To (Proj_no, Emp_no)

Write the SQL commands for the following:

- (a) Change the Proj_name of Proj_no = 'P02' to 'Airlines'.

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- Attribute D is a foreign key referring to attribute F from another table S (assuming S is already created).

- Attribute E is of date datatype.

4. (i) Consider the following Movie database: (10)

Customer

Cust_id	Lname	Fname	Location
A01	Ray	Radhika	SA
A02	Suri	Vandana	MU
A03	Dua	Annie	DA
A04	Basu	Aditya	SA

Movie

Mv_no	Title	Type	Star	Price
1	Rush Hour	Action	Jackie	300
2	Home alone	Comedy	Macaulay	400
3	Carry on Doctor	Comedy	Phillips	350
4	A Real Pain	Drama	Clarke	250

Invoice

Inv_no	Mv_no	Cust_id	Issue_dt
I01	3	A01	23-Jul-99
I02	4	A04	12-Aug-99
I03	2	A02	18-Oct-99
I04	1	A03	11-Aug-99
I05	3	A02	20-Nov-99

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STUDENT

S Id	L Name	F Name	Major	EmailId
B1234	Sethi	Priya	Computer Science	sethipriya@gmail.com
B2233	Negi	Manish	Management	negimanish@gmail.com
B6688	Mishra	Jay	Computer Science	jaymishra@hotmail.com

Grade Report

S Id	CourseNo	CourseTitle	Score
B1234	CS2234	Database	88
B2233	CS2123	Data Structures	78
B6688	CS3212	Web Design	82

For each of the following operations, indicate whether it results in constraint violation and if so, why?

(a) Insert (B1234', Bahl', Tina',

P.T.O.

'Bioinformatics', 'tinabahl@yahoo.com') into the STUDENT table.

(b) Delete

('B2233', 'Negi', 'Manish', 'Management', '0920120120 negimanish@gmail.com') from the STUDENT table.

(c) Update the S_Id of Jay Mishra from 'B6688' to 'B4321' in the STUDENT table.

(d) Insert ('B6688', 'CS2234', 'Database', 72) into the GRADE REPORT table.

(e) Insert ('B2266', 'CS2234', 'Database', 84) into the GRADE REPORT table.

(ii) Differentiate between the following: (5)

(a) Database Intension and Database Extension

(b) Unary and Binary Relation

Exemplify your answer by giving suitable diagrams.

3. (i) Given the following relation with its associated functional dependencies: (8)

Emp_proj

Emp_ssn	Proj_no	Hours	Emp_name	Proj_name
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Emp_ssn → Emp_name

Proj_no → Proj_name

Emp_ssn, Proj_no → Hours

Identify the key attribute of the relation. Normalize the given relation up to 3NF showing all the steps. State the reasons behind each decomposition.

(ii) Give SQL command to create a table T having attributes A, B, C, D, E where: (7)

- Attribute A is a number (maximum 10 digits in length) and cannot contain null values.
- Attribute B is a character string (maximum 50 characters in length).
- Attributes (A, B) form the primary key.
- Attributes C and D contain integer values.
- Default value of attribute C is 6.