Note that many books can be issued to an employee. Also, a book can be issued to many employees. Identify key attributes for each entity type. Clearly specify cardinality ratios and participation constraints. State any assumptions that you make for drawing an ER diagram.

[This question paper contains 16 printed pages.]

20.12.2023(E)

Your Roll No.....

Sr. No. of Question Paper : 2499 **G**

Unique Paper Code : 2344002001

Name of the Paper : Database Management System

Name of the Course : **Computer Science: Generic Elective**

Semester : III

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

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

SECTION A

1. (a) What is the degree and cardinality of the following relation : (2)

FabricID	Fname	Type	Disc
F001	Shirt	Woolen	10
F002	Suit	Cotton	20
F003	Tunic	Cotton	10

(b) Differentiate between the intension and extension of the database. (2)

(c) Are the tuples ordered within a relation? Justify your answer. (2)

(d) Consider the relation state : (3)

P	Q	R	S	T
P1	Q1	50	S1	8
P2	Q2	30	S3	3
P3	Q3	50	S3	4
P1	Q1	50	S2	4
P1	Q3	50	S1	8

Which of the following functional dependencies do not hold for the above relation state?

(i) Q → R

(ii) PS → T

(iii) PQ → T

Which of the following values entered for the columns holds valid? Justify your answer for each case.

(i) '14-12-2023 12 : 40 : 32' for arrivalTime

(ii) 1300000.23 for Fare

(iii) 340 for seatNo

(iv) '2023-12-31 23:15: 43' for arrivalTime

(v) '13000' for Fare

(b) Create an entity relationship diagram for the Book issue system with the following 10 entities : (10)

Employee (empno, name, office, age)

Books (ISBN, title, authors, publisherId)

Loan (empno, ISBN, date, amount)

Publisher (publisherId, name, address, phone)

Write SQL statements to perform the following :

(i) Display the details of students whose address is 'Mumbai'.

(ii) List the names of all the students whose percentage is between 90 to 100.

(iii) Display the name of the youngest student.

(iv) Display the list of names of all the students in alphabetical order.

(v) Find the total number of students.

7. (a) Consider the following SQL statement : (5)

```
CREATE TABLE Flight
(flightNo CHAR(6),
 seatNo INT CHECK(seatNo >=1 and seatNo <=200),
 Name varchar(10),
 arrivalTime datetime,
 Fare Decimal(8,2));
```


(e) List the various cases where the use of a NULL value would be appropriate in the relational model. (3)

(f) Enumerate any three functions of a database administrator (DBA). (3)

(g) Consider the relational schema R(P, Q, R, S, T, U, V) and a set of functional dependencies denoted by FD = {P→Q, QR→ST, PTV→V}. Determine the closure of PR (PR^+). (3)

(h) Give a one-word answer for the following : (4)

(i) An entity that has a primary key of its own

(ii) Attributes that combine to form a Primary key

(iii) Data About Data

(iv) A row in a relational model

P.T.O.

(i) Consider the following relations R and S : (4)

Relation R	
A	B
1	2
3	4

Relation S		
B	C	D
2	5	6
4	7	8
9	10	11

Give the result of the following operations on R and S :

(i) R × S

(ii) R ⋈ S on R.B = S.B

(j) Identify and correct the errors in the following queries, if any : (4)

(i) SELECT COUNT (CustomerID) , Country
FROM Customers
GROUP BY Country
WHERE COUNT(CustomerID) > 5;

6. (a) Consider the following relation and the functional dependencies : (5)

BookID	GenreID	GenreType	Price

BookID → GenreID, Price
GenreID → GenreType

(i) Find the primary key in the above relation.

(ii) Apply normalization to convert it into the Third Normal Form, stating the reason for decomposition.

(b) Consider the following table : (10)

STUDENT

Rollno	Name	DOB	Address	Percentage
1	Jugal	10/01/2003	Mumbai	98
2	Pratigya	24/03/2002	Pune	82
3	Sandeep	12/12/2003	Delhi	91
4	Sangeeta	01/07/2004	Bangalore	96
5	Satti	05/09/2002	Mumbai	89

EMPLOYEE

Empno	EName	Address	Salary	Gender	Dno

DEPARTMENT

Dnum	DName	Manager

(i) Display names of the employees working in Computer Science department and having a salary of more than 50000.

(ii) Display the employee numbers and names of all employees along with their department numbers.

(iii) Display the name and the address of male employees.

(iv) Display the employee numbers and names of all employees, along with their department names and manager names.

(ii) SELECT city, COUNT(*)

FROM Orders

WHERE city LIKE 'D%'

HAVING COUNT(*)>2;

SECTION B

2. (a) Draw the symbol for the following in an ER Diagram : (4)

(i) Weak Entity type

(ii) Relationship type

(iii) Multivalued attribute

(iv) Total Participation Constraint

(b) Consider the relation : (4)

EMPLOYEE (EmpID, Ename, Post, Salary)

Which constraint is violated while performing the operations given below on the relation? Give reasons for each.

(i) INSERT <NULL, 'Rahul', 'Clerk', 20000> into EMPLOYEE.

(ii) DELETE the tuple with EmpID = 'E1'.

(c) Give SQL command to create a relational table with the following information : (7)

Consider a table T with attributes A1, A2, A3, and A4 where :

(i) A1 is a number (with a maximum of 10 digits) and cannot contain NULL

(ii) A2 is a character string (maximum 50 characters in length)

(iii) A3 and A4 are integers

(iv) A1 and A2 form the primary key

Stud_NO	CourseID	SNAME	PHONE	AGE	CourseName
1	C1	RAM	9716271721	20	DBMS
2	C2	JATIN	9898291281	19	HTML
3	C1	SUJIT	7898291981	18	DBMS
4	C3	SUMAN	9899307318	21	C++

Which of the following operationswould result in insert/update/delete anomalies? Justify your answer.

(i) Insert a row with Stud_NO = 7 and CourseID = 'C1'. (3)

(ii) Delete a row with Stud_NO = 2. (2)

(iii) Delete a row with SNAME = 'RAM'. (2)

(b) Write the relational algebra expressions to perform the following operations on the relational schema : (8)

(c) Consider the following Company database schema (8)

EMPLOYEE

Empno	EName	Address	Salary	EmailID	Dno

Write SQL statements to perform the following operations :

(i) Add a column EmailID in the EMPLOYEE table.

(ii) Update the datatype of salary from INT to DECIMAL. Also, define 10,000 as the default value.

(iii) Add a check constraint for the Salary column enforcing salary not above 80000.

(iv) Drop the column Address from EMPLOYEE.

5. (a) Consider the following relation :

STUDENT_COURSE

(v) The default value of A3 is 6

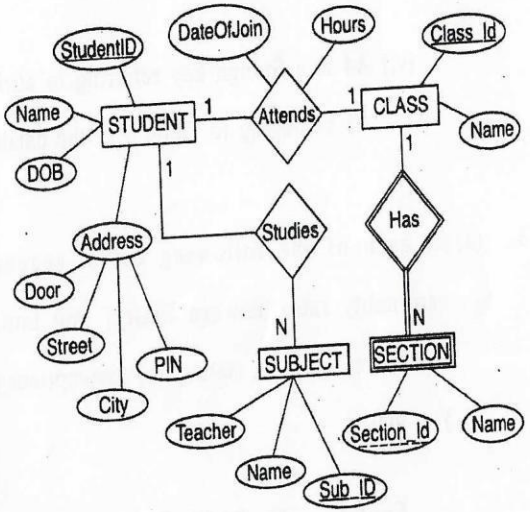
(vi) A4 is a foreign key referring to attribute A5 belonging to Table S in the database

3. (a) In each of the following cases, suggest a cardinality ratio between Entity1 and Entity2. Justify your answer, stating any assumptions that you make. (4)

Entity1	Cardinality Ratio	Entity 2
(i) Employee	.....	Manager
(ii) Actors	.....	Movies
(iii) Cities	.....	Countries
(iv) Author	.....	Books

(Without Co-authorship)

(b) Consider the following entity relationship diagram (ERD): (5)



Map the ERD into relations. Specify the relations (tables) and the constraints enforced on them.

(c) Describe the three-schema architecture of DBMS with the help of a diagram. Differentiate between physical data independence and logical data independence. (6)

4. (a) Consider the relation Printer (model, color, type, price): (3)

(i) Give an instance of relation for Printer.

(ii) Specify the datatype for each data element of Printer.

(b) Consider the Students relation as shown below: (4)

studentID	student_Name	studentEmail	studentAge	CGPA
2345	Shankar	shankar@math	X	9.4
1287	Swati	swati@ee	19	9.5
7853	Shankar	shankar@cse	19	9.4
9876	Swati	swati@mech	18	9.3
8765	Ganesh	ganesh@civil	19	8.7

(i) Suppose (studentName, studentAge) is the composite primary key. Can the value of X be inserted as 19? Justify your answer,

(ii) Is the key mentioned in part (i) time-invariant? Give the justification for your answer.

P.T.O.