

- (c) Consider the following interleaved transactions T1 and T2, executed concurrently. Assuming the initial value $X=5$ and $Y=10$.

T1	T2
Read_item(X)	
$X = X+10$	
	Read_item(X)
write_item (X)	
	$X=X+Y$
	write_item (X)
Read_item(X)	

Compute the value of X after the given schedule is executed. Is the value of X correct? If we remove the interleaving between the transactions T1 and T2, what will be the value of X? (6)

(1500)

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2261

I

Unique Paper Code : 2342573501

Name of the Paper : Database Management Systems

Name of the Course : **B.A. (Prog.) /B.Sc.(P) /B.Sc. Maths. Sc. (NEP-UGCF)**

Semester : V

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. All parts of **Question 1 (Section A)** are compulsory.
3. Attempt **any four** questions from **Section B**.
4. All questions in **Section B** carry equal marks.
5. Attempt **all** parts of a question together.

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SECTION A

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

(i) Number of tuples in a relation

(ii) An entity that doesn't have a primary key of its own

(iii) Minimal superkey

(iv) An attribute that can take multiple values

(b) Consider the relation: (2)

Laptop (Model, clockFrequency, RAM, SSDCapacity, price) Find the degree of the relation. Are all the attributes of the relation Laptop atomic?

(c) Given relational schema **R(P, Q, R, S, T)** and the set of functional dependencies denoted by **FD = {P→QR, RS→T, Q→S, T→P}**. Show the steps to compute the closure of T (**T⁺**). (3)

(d) Consider the relation:

(i) $Q \rightarrow R$

(ii) $PQ \rightarrow S$

(iii) $PQ \rightarrow T$

7. (a) Consider a file having 20,000 STUDENT records of fixed length. Each record has the (5) following fields: ID# (7 bytes), name (25 bytes), address (50 bytes), dob (5 bytes) and course (12 bytes).). An additional byte is used as a deletion marker. This file is stored on a disk of block size B:512 bytes. Compute the following: (5)

(i) record length (R)

(ii) blocking factor (bfr)

(iii) number of file blocks (b)

(iv) number of block accesses required during binary search on the data

(b) Define four desirable properties of a Transaction that should be enforced by the Concurrency control? (4)

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(b) **SELECT SNO, STATUS****FROM Supplier****WHERE CITY = 'Delhi'****ORDER BY STATUS;**(c) **SELECT DISTINCT SNAME****FROM Supplier S, SupplyPart P****WHERE Quantity BETWEEN 100 AND 200
AND S.SNO=P.SNO;**

(c) Consider the relation:

(4)

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 does not hold for the above relation? Justify.

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X	Y	Z
x1	y1	z1
x2	y1	z1
x1	y1	z2
x2	y1	z3

(i) List two functional dependencies that this relation state satisfies.

(ii) Assume that the value of attribute z changes from z3 to z2. Now list one functional dependency that this relation instance satisfies. (3)

(f) Decompose the table into 1NF:

Roll No	Name	City	Phone No
1	Subodh	Delhi	11111111111, 22222222222
2	Jitesh	Goa	33333333333
3	Sunil	Jaipur	44444444444, 55555555555
4	Piyush	Rohtak	77777777777

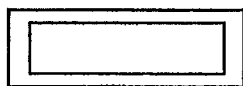
(3)

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- (g) What do these symbols represent in an ER Diagram? (3)



- (h) Consider the following two relations, M and N:

M

X	Y	Z
5	3	6
10	7	9
15	2	7

N

P	Q	R
5	10	6
11	7	12
15	2	7

(3)

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4. Insert <10, 'Anu', 25, 'Patparganj'>

5. Insert <7, 'ajay', '25', 'Patparganj'>

- (b) Consider the supplier database (6)

Supplier

SNO	SNAME	STATUS	CITY
S1	Prentice Hall	30	Calcutta
S2	McGraw Hill	30	Mumbai
S3	Wiley	20	Chennai
S4	Pearson	40	Delhi
S5	Galgotia	10	Delhi

SupplyPart

SNO	PNO	Quantity
S1	P1	300
S1	P2	200
S2	P1	100
S2	P2	400
S3	P2	200
S4	P2	200

What is the output on the execution of following SQL queries?

- (a) **SELECT SNO FROM Supplier**

WHERE STATUS > 20 AND CITY LIKE 'C%';

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(iii) Change the city of the employee whose empName is 'Anil'.

(iv) Delete the record of all employees who live in Mumbai.

(v) Insert a new employee

('E009', 'XYZ', 'North', 'Delhi', 25000) (5)

6. (a) Consider the Relation PERSON (5)

PERSON ID	NAME	AGE	ADDRESS
1	Sanjay	35	Patel Nagar
2	Sharad	30	Mayur Vihar
3	Vibhu	36	North Campus

Check if any of the constraints gets violated, if the following operations are performed on the above tables. Consider each operation independent of others and justify your answers.

1. Insert <1, 'Vipin', 20, 'Mayur Vihar'>

2. Insert<'null' 'Anurag', 25, 'Patparganj'>

3. Insert<' abc', 'Suman', 25, 'IP college'>

The attributes X, Y, and Z of relation M are union-compatible with the attributes P, Q, and R of relation N, respectively. What will be the result of the relational algebra expressions:

$$(i) M \bowtie (M.X = N.P) N$$

$$(ii) M \cap N$$

$$(iii) M \cup N \quad (3)$$

(i) Consider a relation- R (V, W, X, Y, Z) with functional dependencies:

$$VW \rightarrow XY$$

$$Y \rightarrow V$$

$$WX \rightarrow YZ$$

Find three possible candidate keys. (3)

(j) Consider the following relational schema:

Employee (empNo, name, office, age)

Books (isbn, title, authors, publisher)

Issued (empNo, isbn, date)

Write an SQL query to perform the following operations:

- (a) Find the names of employees who have issued a book published by **CS_Press**.
- (b) Find the names of employees who have issued the maximum number of books.
- (c) Find the titles of books issued by employees whose name ends with the letter **'m'**. (6)

SECTION B

2. (a) Differentiate between Entity set and Entity type with the help of suitable example(s). (2)
- (b) Describe the three-schema architecture of database design with the help of a diagram. (3)
- (c) A Company maintains the following tables for its Database:

Map the ERD into relations. Specify the relations (tables) and identify the primary key and foreign key of each relation. (5)

5. (a) Consider a relation **R (A, B, C, D, E, F, G, H, I, J)** and the set of functional dependencies (10)

$F = \{ AB \rightarrow C, BD \rightarrow EF, AD \rightarrow GH, G \rightarrow I, H \rightarrow J \}$.

Find all possible candidate keys of **R**. Also, give an example of a super key of **R**.

Check whether **R** is in 2NF. If not, decompose the relation **R** into a set of 2NF relations. Check whether **R** is in 3NF. If not, Decompose the relation **R** into a set of 3NF relations. (5)

- (b) Consider the relation **Employee**:

Employee (empNo, empName, street, empCity, salary)

- (i) Rename the attribute **empNo** of the Employee table to **EID**.
- (ii) Add an attribute for the phone number.

Write SQL statements to perform the following:

- (i) To display the sum of the MARKS1 of all the students.
- (ii) To display the names of all the students who scored more than 50 marks in MARKS 2.
- (iii) Display record of all students whose total marks are greater than the total marks of the student whose name is 'AMAN'.
- (iv) Display total marks of the youngest student.
- (v) Using appropriate command, remove the column COUNTRY from STU_DETAILS.

(10)

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

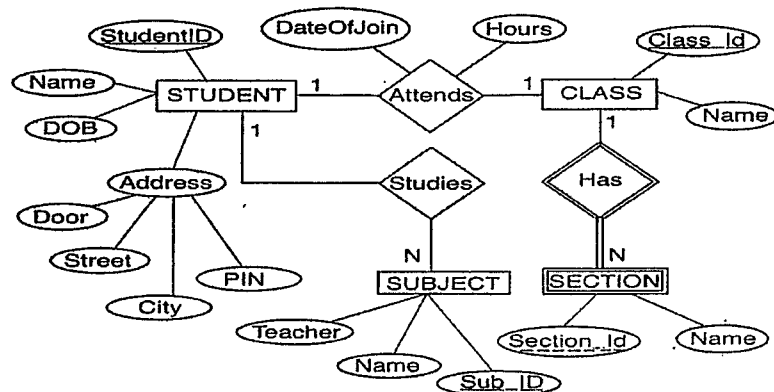


Table	Attributes
Executive	E_Id, Name, Address, Salary, Date_of_Joining,
Product	P_Id, Name, Price
Customer	C_Id, Name
Order	Invoice_No, Date_of_Purchase, P_Id, E_Id, C_Id, Quantity

Construct an ER diagram for the above database. An invoice is given by the executive. Each executive can write many invoices but each invoice is written by only one executive. The invoice is written for a single customer but each customer can have many invoices. Clearly specify cardinality ratios and participation constraints. State any assumptions that you make for drawing an ER diagram. (10)

3. (a) Suggest cardinality ratios of the given relationships based on common meaning. In each case, justify your answer.

Entity 1	Entity 2	Relationship name
Student	Course	Enrols
Player	Sports	Play
State	Chief Minister	Governs
Customer	Product	Purchases
Person	Mobile	Owns

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(b) Consider the following relation:

STUDENT_COURSE

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++

Does the following operation result in any modification anomaly? Justify your answer. Insert into **STUDENT_COURSE**

values (4,'C4','Mohit', 9876546788,20,' CN')

(2)

(c) Write the relational algebra expression to perform the following operations on the relation schema given below:

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EMPLOYEE

Empno	ENAME	Address	Salary	Gender	Dno
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DEPARTMENT

Dnum	DName	Manager
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- (i) Retrieve the details of all employees who either work in department number 4 and earn at least 25,000, or work in department number 5 and earn at least 30,000.
- (ii) Retrieve the first name, last name, and salary of all employees who work in department number 5.
- (iii) Retrieve the names of managers for each department.
- (iv) Display the name and the address of female employees.

(8)

4. (a) Consider the two relations given below:

STU_DETAILS (RNO, SNAME, DOB, ADDR1, ADDR2, CITY, COUNTRY) MARK_DETAILS (RNO, MARKS1, MARKS2, MARKS3, TOTAL)

P.T.O.