

- (i) Insert <5, "Khushi", 10> in EMPLOYEE
- (ii) Insert <4, "Samarth", 22> in EMPLOYEE
- (iii) Delete <11, "Research", Delhi> from
DEPARTMENT
- (iv) Insert <10, "IT", Mumbai> in DEPARTMENT
- (v) Modify <2, "Ayushi", 22> in EMPLOYEE

(5)

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1456**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.

SECTION A

- 1 (a) Give three advantages of the DBMS approach over the traditional file system approach. (3)

- (b) Draw the Entity Relationship diagram and provide (min, max) constraint for the below-mentioned statement:

"Each course must be taught by at least one teacher and can be shared by four teachers in total. Each teacher can teach many courses" (3)

- (c) Differentiate between the following:

(i) Key and Super key

(ii) Inner Join and Outer Join (3)

- (d) Classify the following commands as Data Definition Language (DDL) or Data Manipulation Language (DML):

(i) ALTER TABLE

EMPLOYEE

Eno	Ename	Dno
1	Sakshi	11
2	Dhirti	22
3	Parth	33

DEPARTMENT

Dnum	Dname	Dloc
11	Research	Delhi
22	HR	Mumbai
33	Finance	Kolkata

Here Eno is the Primary key and Dno is the Foreign key of the EMPLOYEE relation. Dnum is the Primary key of Department relation.

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

T1	T2
read_item (P)	
P = P + 10	
	read_item (P)
	P = P + R
write_item (P)	
read_item (R)	
	write_item (P)

After the completion of the transaction T1 and T2 what will the value of P? Is this the correct value, if not then, specify the problem. (6)

(b) What is the significance of the Atomicity and Isolation properties amongst the ACID properties of transactions?. (4)

(c) Consider the following relations:

(ii) INSERT INTO

(iii) CREATE TABLE (3)

(e) Consider the tables T1 and T2 as follows:

T1			T2		
P	Q	R	A	B	C
2	20	c	1	10	a
1	10	b	2	20	b
3	30	c	3	10	a
1	40	a	4	30	a

The domain of A, B, C are compatible with P, Q, R, respectively.

Show the result for each of the following:

(i) $T1 \bowtie_{(T1.R = T2.C)} T2$

(ii) $T1 \bowtie_{(T1.Q = T2.B)} T2$ (3)

(f) Consider the following relation:

A	B	C	Tuple#
10	B1	C1	1
10	B2	C2	2
11	B4	C1	3
12	B3	C4	4
13	B1	C1	5
14	B3	C4	6

Given the relation state, which of the following dependencies will not hold? Justify your answer.

(i) $A \rightarrow B$

(ii) $B \rightarrow C$

(iii) $C \rightarrow B$

(3)

(g) Identify the rules for each of the following Armstrong's axioms.

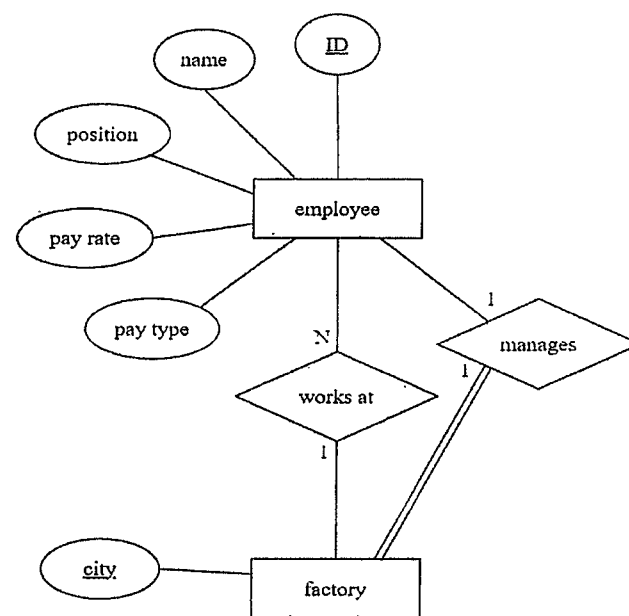
(i) $\{A \rightarrow B\} \mid = AC \rightarrow BC$

(ii) $\{A \rightarrow B, B \rightarrow C\} \mid = A \rightarrow C$

Find the closure of E^+ and AC^+

(4)

(c) Map the following ER diagram into relational tables indicating primary Key and foreign key of each relation.



(5)

7. (a) Two transactions T1 and T2 are executing concurrently with initial values of P=50 and R= 5

P.T.O.

- D is a foreign key referring to attribute E from another table S of the database (assuming S is already created) (6)

(c) Prove that any relation schema with two attributes is in BCNF. (3)

6. (a) Give an example and draw the corresponding symbol used in an Entity Relationship diagram for the following:

- (i) Complex attribute
- (ii) Key attribute of an entity
- (iii) Derived attribute (6)

(b) Consider the relation $R = (A, B, C, D, E, F)$ and the following set of functional dependencies.

$$\{C \rightarrow F, \\ E \rightarrow A, \\ EC \rightarrow D, \\ A \rightarrow B\}$$

$$(iii) \{A \rightarrow B, A \rightarrow C\} \models A \rightarrow BC \quad (3)$$

(h) Consider the relation $R (A, B, C, D, E)$ with the following dependencies:

$$AB \rightarrow C, CD \rightarrow E, DE \rightarrow B$$

Is AB a candidate key of this relation? If not, is ABD? Explain your answer. (3)

(i) Consider a data file **STUDENT** (Sid, Sname, CourseNo, Dob, Address). Create the primary index (on Sid) on the above file diagrammatically. Is the above index file is dense or sparse? Justify your answer. (3)

(j) Consider a relation $R (A, B, C, D, E)$ and the following set of functional dependencies:

$$F: \{ B \rightarrow C, BC \rightarrow D, E \rightarrow BD, E \rightarrow A \}$$

Find closure of the following under F:

- (i) B
- (ii) BC
- (iii) E (3)

SECTION B

2. (a) Explain the three-schema architecture of DBMS. Also draw the example. (5)
- (b) Consider a real estate database. The database stores information about the real estate firms in Delhi and the houses that are available for sale. The data about the customers looking to buy the houses is also maintained. The data requirements are as follows:
- (i) The data stored for a house includes its registration ID, address, owner name, and sale price.
 - (ii) The house for sale can be listed with one or more firms. Being "listed" with a firm means

- (v) List the customer names who lives in a city starting with a letter D. (10)

5. (a) Consider the relation $R = \{P, Q, R, S, T, U, V, W, X, Y\}$ following set of functional dependencies

$$F: \{ PQ \rightarrow R, QS \rightarrow TU, PS \rightarrow VW, P \rightarrow X, W \rightarrow Y \}$$

Find Primary Key and decompose R into 2NF and then 3NF. (6)

- (b) Give SQL command to create a table T having attributes A,B,C,D where:

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

ORDER_ITEM (Order#, Item#, Qty)

ITEM (Item#, Unit_price)

SHIPMENT (Order#, Warehouse#, Ship_date)

WAREHOUSE (Warehouse#, City)

- (i) List the Order# and Ship_date for all orders shipped from Warehouse# W2.
- (ii) List the Warehouse# from which the customer named "ABC" was supplied his orders along with the Order#.
- (iii) Produce a listing Cname, No_of_orders, Avg_order_amt, where the middle column is the total number of orders ordered by the customer and the last column is the average order amount for that customer.
- (iv) List the orders that were not shipped within 30 days of ordering.

the house owner has a contract with an agent who works for that firm.

- (iii) Agents are uniquely identified by their AgentID. Their names and addresses are also recorded.
- (iv) The deal of a house can only be worked on by a single agent. An agent can simultaneously work on more than one house for sale.
- (v) A house may also have one or more rooms. Each room is represented by its type (bed, bath, drawing, dining), type of heating (electric, water, none) and size. The room is to be modelled as a weak entity.

Draw an Entity Relationship diagram for the given real estate database. The diagram should necessarily include the following:

- (i) Entities and their attributes
- (ii) Relationships

(iii) Cardinality and participation constraints
(10)

3. (a) Consider an ordered file with the number of records $r = 30000$ stored on a disk with block size $B = 1024$ bytes. Find the blocking factor for the file, the number of blocks needed for the file and number of block accesses needed by a binary search on this data file. (5)

- (b) Consider a database that consists of the following relations.

SUPPLIER (Sno, Sname)

PART (Pno, Pname)

PROJECT (Jno, Jname)

SUPPLY (Sno, Pno, Jno)

The database records information about suppliers, parts, projects and includes a ternary relationship **SUPPLY** between suppliers, parts, and projects. Write relational algebraic expressions to perform

the following:

- (i) Retrieve the part numbers that are supplied to exactly two projects.
- (ii) Retrieve the names of suppliers who supply more than two parts to project 'J1'.
- (iii) Retrieve the total number of suppliers.
- (iv) Retrieve the project names that are supplied by supplier 'S1' only.
- (v) Retrieve the part number and total project for each supply. (10)

- 4 (a) How is OUTER UNION operation different from UNION operation? Explain with an example. (5)

- (b) Specify the following queries in SQL on the database schema

CUSTOMER (Cust#, Cname, Address)

ORDER (Order#, Odate, Cust#, Ord_amt)