संगणक विज्ञान एवं अभियांत्रिकी विभाग
मोतीलाल नेहरू राष्ट्रीय प्रौद्योगिकी संस्थान इलाहाबाद
प्रयागराज - 211004, भारत
Department of Computer Science & Engineering
Motilal Nehru National Institute of Technology Allahabad
Prayagraj-211004, India

Mid Semester Examination 2022-23 (odd)

Programme Name: **MCA**
Semester: **III**
Course Name: **Database Management System**
Course Code: **CS33102**
Reg. No.: 2021CA075
M.Marks: 25
Duration: 90 Minutes

Instructions: (Related to Questions)

1) Attempt all the questions.
2) Make and state necessary assumption (if any) clearly.

Marks

Q1. Consider the following schema: 4x2=8

Suppliers (sid: integer, sname: string, address: string)
Parts (pid: integer, pname: string, color: string)
Catalog (sid: integer, pid: integer, cost: real)

The key fields are underlined, and the domain of each field is listed after the field name. The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in SQL, relational algebra.
I. Find the names of suppliers who supply some red part.
II. Find the sids of suppliers who supply some red or green part.
III. Find the sids of suppliers who supply some red part and some green part.
IV. Find the sids of suppliers who supply every red part.

Q2. Explain the following terms (any 4) with suitable examples : 4x2=8

a) Participation constraint
b) Entity and entity set
c) Overlap and covering constraint
d) Weak entity set
e) Aggregation

Q3. Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer.

i. Each musician that records at Notown has an SSN, a name, an address, and a phone number.
ii. Poorly paid musicians often share the same address, and no address has more than

one phone.

iii. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).

iv. Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.

v. Each song recorded at Notown has a title and an author.

vi. Each musician may play several instruments, and a given instrument may be played by several musicians.

vii. Each album has a number of songs on it, but no song may appear on more than one album.

viii. Each song is performed by one or more musicians, and a musician may perform a number of songs.

ix. Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

a	Design a conceptual schema for Notown and draw an ER diagram for your schema. The preceding information describes the situation that the Notown database must model. Be sure to indicate all key and cardinality constraints and any assumptions you make. Identify any constraints you are unable to capture in the FR diagram and briefly explain why you could not express them	7
b	Map the ER diagram drawn in part (a) above into relational schema. Justify your choice of mapping options.	2

(1) SELECT S.sname
FROM suppliers S, parts P, catalog C
WHERE P.color = 'red' AND C.pid = P.Pid AND C.sid = S.sid.

(2) SELECT T.C.sid
FROM catalog C, parts P
WHERE (P.color = 'red' OR P.color = 'green')
AND P.pid = C.pid.

(3) SELECT C.sid.
FROM Catalog C
WHERE NOT EXISTS (SELECT P.Pid
FROM ~~WHERE~~ parts P
WHERE P.color = 'red'
AND (NOT EXISTS (SELECT C1.sid
FROM catalog C1
WHERE C1.sid = C.sid AND
C1.pid = P.pid)))

SELECT C.sid
FROM parts P, catalog C
WHERE P.color = 'red' AND P.pid = C.pid
AND EXISTS (SELECT P2.pid
FROM parts P2, catalog C2
WHERE P2.color = 'green' AND
C2.sid = C.sid AND
P2.pid = C2.pid)

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End Semester Examination 2022-23 (odd)

Programme Name: **MCA**
Course Name: **Database Management System**
M.Marks: **50**
Duration: **2.5 Hours**

Semester: **III**
Course Code: **CS33102**
Reg. No.: | | | | | | | | | |

Instructions: (Related to Questions)
1) Attempt all the questions
2) Make and state necessary assumption (if any) clearly

			Marks
Q1	**a**	What is the difference between logical data independence and physical data independence? Which one is harder to achieve? Why?	2
	b	List four significant differences between a file-processing system and a DBMS. What are the different types of database end users? Discuss the main activities of each.	3
	c	You are asked to design a database for recording information about magazines, their writers, and subscribers, for a publication house. The information requirements include: - For each magazine, its name, its writers, its editor, and the cities to which it is delivered. - For each writer, their name. (Note: a writer can write for more than one magazine, but can only edit, at most, one magazine.) - For each subscriber, their name, favorite writers, city of residence, and what magazines they receive. **i.** Draw an **ER diagram** for the above requirements. **ii.** After you have finished your design, you are then asked to incorporate a new information requirement that keeps record of a relationship ***Researched-by*** among two writers and a magazine. The intention is that this relationship set consists of triples ***(writer1, writer2, magazine)*** such that *writer1* wrote for the *magazine* at a time when some other *writer2* was the magazine's editor. Draw the modification to the E/R diagram. **iii.** Replace your ternary relationship (in part ii) with a new entity set and binary relationships.	5
Q2	**a**	Consider the relational database below where the primary keys are underlined ***employee*** *(person_name, street, city)* ***works*** *(person_name, company_name, salary)* ***company*** *(company_name, city)* ***manages*** *(person_name, manager_name)* Give an expression in **relational algebra** and **SQL** for each of the following queries: **i.** Find the names and cities of residence of all employees who work for ***"First Bank Corporation"***. **ii.** Find the names, street addresses, and cities of residence of all employees who work for ***"First Bank Corporation"*** and earn more than ***$10,000***.	8

iii. Find the names of all employees in this database who live in the same city as the company for which they work.

iv. Assume the companies may be located in several cities. Find all companies located in every city in which ***"Small Bank Corporation"*** is located.

b Explain with example the mapping of M:N relationship in a ER diagram to a corresponding relational schema. 2

Q3 a Suppose you are given a relation R with four attributes ABCD and a set of functional dependencies $F\{A \rightarrow B, BC \rightarrow D, A \rightarrow C\}$. Assuming those are the only dependencies that hold for R, do the following: 6

i. Identify the candidate key(s) for R.

ii. Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).

iii. If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.

b What is a functional dependency? What are the possible sources of the information that defines the functional dependencies that hold among the attributes of a relation schema. 4

Q4 a Consider the following classes of schedules: 3

Conflict-serializable, recoverable and avoids-cascading-aborts.

For each of the following schedules, state which of the above classes it belongs to. If you cannot decide whether a schedule belongs in a certain class based on the listed actions, explain briefly.

i. T1:R(X), T2:W(X), T1:W(X), T2:Abort, T1:Commit

ii. T1:R(X), T2:W(X), T1:W(X), T2:Commit, T1:Commit

b Consider the following two transactions: 4

```
T1: read(A);
    read(B);
    if A = 0
    then B := B + 1;
    write(B).
T2: read(B);
    read(A);
    if B = 0
    then A := A + 1;
    write(A).
```

Let the consistency requirement be A = 0 ∨ B = 0, with A = B = 0 the initial values.

i. Show a concurrent execution of T_1 and T_2 that produces **a non-serializable schedule**.

ii. Is there a concurrent execution of T_1 and T_2 that produces **a serializable schedule**?

c What is the difference between left outer join and full join? Explain with suitable example. 3

Q5 a What are some variations of the two-phase locking protocol? Why is strict or rigorous two-phase locking often preferred? 4

b Explain the following terms **(any 4)** with suitable examples : 6

i. Participation constraint ii. Weak entity set iii. Primary and clustered index

iv. Multivalued Dependency v. Role Indicator