Roll No. 2201020036

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B. Tech. EXAMINATION, 2022

Semester IV (CBCS)

DATABASE MANAGEMENT SYSTEM (CSE, IT)

CS-401

Time : 3 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory.

Section A

1. (a) Explain the three-schema architecture of DBMS. 5

(b) What is the difference between strong entity set and weak entity set ? 5

2. (a) What are different mapping constraints in ER modelling ? 5

(b) What are the responsibilities of database administrator ? 5

Section B

3. Consider the following schema :

Suppliers (sid: integer, sname: string, address: string)

Parts (pid: integer, pname: string, address: string)

Catalog (sid: integer, pid: integer, cost: real)

The key fields are underlined and domain of each field is listed after the field name. Based on above answer the following in relational algebra notations :

(a) Find the name of suppliers who supply some red parts

(b) Find the sids of suppliers who supply some red or green parts.

(c) Find the sids of suppliers who supply some red part or are at Himachal address.

(d) Find the sids of supplier who supply some red part and some green part.

(e) Find the sids of suppliers who supply every part. 10

4. Consider the following tables

User

Id	Name	Age	Gender	Occupation Id	City Id
1	John	25	Male	1	3
2	Sara	20	Female	3	4
3	Victor	31	Male	2	5
4	Jane	27	Female	1	3

Occupation

OccupationId	OccupationName
1	Software Engineering
2	Accountant
3	Pharmacist
4	Library Assistant

City

CityId	CityName
1	Halifax
2	Calgary
3	Boston
4	New York
5	Toronto

(i) Solve (Output) the following relational expressions for above relations :

(a) $P_{Name}(R_{Age > 25}(User))$

(b) $R_{Id > 2 \wedge Age! = 31}(User)$

(c) $R_{User.OccupationId = Occupation.OccupationId}(User \times Occupation)$

(d) User ⋈ Occupation ⋈ City

(e) $P_{Name,Gender}(R_{CityName = "Boston"}(User \bowtie City))$.

(ii) Write SQL statements for relational expressions in question i. 5

Section C

5. Examine the table shown below : 10

Staff No	Branch No	Branch Address	Name	Position	Hours Per Week
S4555	B002	Delhi	Ellen Layman	Assistant	16
S4555	B004	Chandigarh	Ellen Layman	Assistant	9
S4612	B002	Mumbai	Dave Sinclair	Assistant	14
S4612	B004	Himachal	Dave Sinclair	Assistant	10

(a) Why is this table not in 2NF ?

(b) Describe and illustrate the process of normalizing the data shown in this table to third normal form (3NF).

(c) Identify the primary, (alternate) and foreign keys in your 3NF relations.

6. (a) Compare 4NF and 5NF with examples. 5

(b) Write a short note on serializability and two phase locking. 5

Section D

7. (a) Explain the concept of concurrency control by timestamps. 5

(b) How deadlock are handled in distributed database ? 5

8. (a) What are the transaction validation techniques or methods ? 5

(b) How serializability is achieved using locks ? 5

(Compulsory Question)

9. (a) What is a checkpoint in DBMS ?

(b) What are the unary operations in relational algebra ?

(c) What are the three levels of database abstraction ?

(d) What is Denormalization ?

(e) What is referential integrity constraint ?

(f) What is logical data independence ?

(g) Explain ACID properties of transaction.

(h) What is the difference between shared lock and exclusive lock ?

(i) What is a super key ?

(j) How validation in concurrency control is done ?

2×10=20