National Institute of Technology Mizoram

Mid – Semester Examination, Odd Semester - 2021

Database Management System (CSL 1504)

B.Tech 5th Semester CSE **Full Marks: 15 marks** **Duration 1:00 hour**

Answer all questions (briefly, to-the-point, pointwise)

1.

a) Are constraints necessary for relational database? Give reasons with proper example for any one of them. What would be the problem in the absence of the constraint described by you? (1+4)

b) Differentiate among 'Total Participationship Constraint' and 'Partial Participationship Constraint' with a short example. (3)

c) Consider a relation schema R = (A, B, C, D, E, H) on which the following functional dependencies hold: {A–>B, BC–> D, E–>C, D–>A}. Find out if there are any candidate keys of R? (4)

d) How would you handle an entity, which has no attributes that can be designated as a key attribute? Give an example. (3)

National Institute of Technology Mizoram

End – Semester Examination, Odd Semester - 2021

Database Management System (CSL 1504)

B.Tech 5th Semester **Full Marks: 30 marks** **Duration: 2:00 hours**

ANSWER ALL QUESTIONS

1.

a) Consider schedules S1, S2, and S3 below. Determine whether each schedule is strict, cascadeless, recoverable, or nonrecoverable.

S1: r1 (X); r2 (Z); r1 (Z); r3 (X); r3 (Y); w1 (X); c1; w3 (Y); c3; r2 (Y); w2 (Z); w2 (Y); c2;

S2: r1 (X); r2 (Z); r1 (Z); r3 (X); r3 (Y); w1 (X); w3 (Y); r2 (Y); w2 (Z); w2 (Y); c1;c2; c3;

S3: r1 (X); r2 (Z); r3 (X); r1 (Z); r2 (Y); r3 (Y); w1 (X); c1; w2 (Z); w3 (Y); w2 (Y);c3; c2;

[7]

b) Give an example of Union Compatible relations?
[3]

2.

a) Explain the difference between 'Strict 2PL' and 'Rigorous 2PL' with an example. Also mention whether they are deadlock free protocols or not.
[4+1]

b) What is the importance of join dependency? Consider a relation REL(M, Y, P, MP, C) and the following set F of functional dependencies: F = {M → MP, {M, Y} → P, MP → C}. Consider the decomposition of REL into D = {R1(M, Y, P), R2(M, MP, C)}. Is this decomposition lossless? Show your solution by using non-additive join test algorithm.
[1+4]

3. a) Write the Relational algebra and Tuple Relational Calculus expression for the following ;

students: (SS#, name, PUaddr, homeAddr, classYr)
employees: (SS#, name, addr, startYr)
assignment: (position, division, SS#, managerSS#)
study: (SS#, academic_dept., adviser)

Find names of all CS students working for the library (library is a division).
[3x2]

b) What is the importance of indexing in database?
[2]

c) Mention the steps by which a query can be optimized.

National Institute of Technology Mizoram

Mid- Semester Examination, Odd Semester (2022-23)

Database Management System (CSL – 1504)

Semester - 5th | Full Marks - 30 | Duration - 1:30 hours

Answer all 3(Three) Questions. All Questions carry same marks

(3 * 10 = 30 Marks)

1. a) Briefly mention any four advantages of Database systems over file systems. What do you mean by durability of your database? (5)

b) Consider the given set of functional dependencies- (5)

F: = {A → C, AB → C, C → DI, CD → I, EC → AB, EI → C}

Find the minimal cover of F.

OR

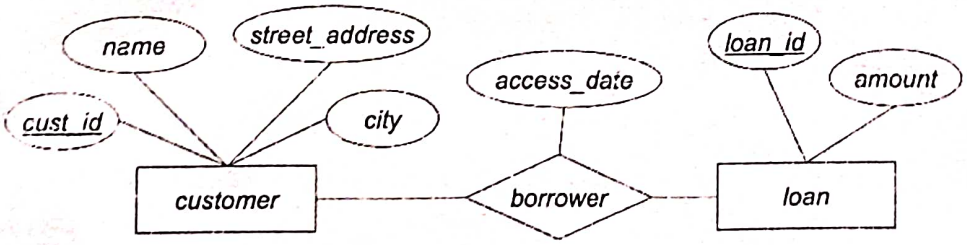
c) Explain briefly how the three layers of Database Architecture helps in accessing data and maintaining the advantages of database. Draw proper figure if necessary. (5)

d) Consider a relation R(A,B,C,D,E,F,G,H,I,J) with the following functional dependencies. (5)

F = { AB -> C, A->DE , B->F , F->GH , D- > IJ }

If the given relation is decomposed in to BCNF then which of the above functional dependencies will be lost?

2. a) Build the relational model for the below mentioned ER diagram (5)



b) State the reason behind usage of inference rules and why Armstrong's Axiom is called 'Sound and Complete'? (5)

OR

c) A Database design should be well supported various constraints. Name any two constraints and give proper examples. (1+4)

d) Given two relations having the following schema. (5)

Department (Dpt_no, Dname, Dloc) and

Employee (Eno, Ename, Esal, Eadd, E_dept)

Assuming Dpt_no and E_dept to have the same domain write the relational algebra expression for the following.

Find out all the employees who work in Research Dept having office location in Delhi and having salary greater than 5Lakhs.

3. a) What are the conditions where NULL value is inserted in the database? Is it preferred for the database design? (4+1)

b) Give example of any two anomalies that occur during database updation. (5)

OR

a) Briefly describe the different types of attributes found in a database relation in the context of ER diagram. (5)

b) Write short notes on the following. (2.5x2)

i) Partial Functional dependency

ii) 1NF

National Institute of Technology Mizoram

End – Semester Examination, Odd Semester - 2022

Database Management System (CSL 1504)

B.Tech 5th Semester **Full Marks: 50 marks** **Duration: 3:00 hours**

Answer All Questions. All Questions Carry Same Marks

(5 * 10 = 50 Marks)

1. (3+3+2+2)

a) Consider the following four schedules due to three transactions (indicated by the subscript) using read and write on a data item x, denoted by r(x) and w(x) respectively. Which one of them is conflict serializable?

(A) $r_1(x)$; $r_2(x)$; $w_1(x)$; $r_3(x)$; $w_2(x)$

(B) $r_2(x)$; $r_1(x)$; $w_2(x)$; $r_3(x)$; $w_1(x)$

(C) $r_3(x)$; $r_2(x)$; $r_1(x)$; $w_2(x)$; $w_1(x)$

(D) $r_2(x)$; $w_2(x)$; $r_3(x)$; $r_1(x)$; $w_1(x)$

b) Assume that Ti requests a lock held by Tj. The following table summarizes the actions taken for

	Wait – die scheme	Wound – wait scheme
Ti is younger than Tj	W	X
Ti is older than Tj	Y	Z

wait-die and wound-wait scheme:
Fill correct status of Ti and Tj at W, Y, X, and Z respectively.

A) Ti dies, Ti waits, Tj waits, and Tj aborts respectively.
B) Ti dies, Ti waits, Ti waits, and Tj aborts respectively.
C) Ti waits, Ti dies, Ti waits, and Tj aborts respectively.
D) None of these

c) Differentiate between LEFT and RIGHT OUTER join with example.

d) Give an example of Union Compatible relations.

2.

a) select name, floor
from emp, dept
where emp.dno=dept.dno and sal>100K
Find the optimised query tree for the above query. Explain your reason behind it. (5)

b) The below figure shows the log corresponding to a particular schedule at the point of a system crash for four transactions T_1, T_2, T_3, and T_4. Suppose that we use the *immediate update protocol* with checkpointing. Describe the recovery process from the system crash. Specify which transactions are rolled back, which operations in the log are redone and which (if any) are undone, and whether any cascading rollback takes place. (5)

[start_transaction, T_1]
[read_item, T_1, A]
[read_item, T_1, D]
[write_item, T_1, D, 20, 25]
[commit, T_1]
[checkpoint]
[start_transaction, T_2]
[read_item, T_2, B]
[write_item, T_2, B, 12, 18]
[start_transaction, T_4]
[read_item, T_4, D]
[write_item, T_4, D, 25, 15]
[start_transaction, T_3]
[write_item, T_3, C, 30, 40]
[read_item, T_4, A]
[write_item, T_4, A, 30, 20]
[commit, T_4]
[read_item, T_2, D]
[write_item, T_2, D, 15, 25] ← System crash

3. a) Consider the following relation R(A,B,C,D,E,F) and FDs A->BC, C->A, D->E, F->A, E->D. Is the decomposition of R into R1(A,C,D), R2(B,C,D) and R3(E,F,D) lossless? (5)

(b) Consider the following relations for a database that keeps track of automobile sales in a car dealership (OPTION refers to some optional equipment installed on an automobile): (5)

CAR(Serial_no, Model, Manufacturer, Price)
OPTION(Serial_no, Option_name, Price)
SALE(Salesperson_id, Serial_no, Date,Sale_price)
SALESPERSON(Salesperson_id,Name, Phone)

First, specify the foreign keys for this schema, stating any assumptions you make. Next, populate the relations with a few sample tuples, and then give an example of an insertion in the SALE and SALESPERSON relations that violates the referential integrity constraints and of another insertion thatdoes not.

4. a) Define fourth normal form. When is it violated? (2+2)

b) Draw Transaction state diagram and explain in detail its each stage. (2+4)

5.

a) When does a collision occur in hashing? Explain different collision resolution techniques. (5)

b) Consider following two sets of dependencies

F1={A->C,AC->D,E->AD,E->H} and F2={A->CD,E->AH}

Check whether they are equivalent or not. (5)