Jaypee Institute of Information Technology, Noida

End Term Examination, 2021
B.Tech 3rd Semester

Course Title: Database Systems and Web | **Maximum Time : 2hrs**
Course Code: 15B11CI312 | **Maximum Marks : 35**

CO1: Explain the basic concepts of Database systems and web components.
CO2: Model the real world systems using Entity Relationship Diagrams and convert the Er model into a relational logical schema using various mapping algorithms
CO3: Develop a simple web application with client and server side scripting using JavaScript and PHP and connect with a given relational database.
CO4: Make use of SQL commands and relational algebraic expression for query processing.
CO5: Simplify databases using normalization process based on identified keys and functional dependencies.
CO6: Solve the atomicity, consistency, isolation, durability, transaction and concurrency related issues of databases.

[CO6] Q1. Consider schedules H1 and H2 given below:
H1: r1(x); r2(z); r1(z); r3(x); r3(y); w1(x); w3(y); r2(y); w2(z) w2(y); c1; c2; c3
H2: r1(x); r2(z); r3(x); r1(z); r2(y); r3(y); w1(x); w2(z); w3(y); w2(y); c3; c2.

Determine and explain whether each schedule is conflict-serializable, cascadeless, recoverable or not. [5]

[CO6] Q2. For the lock requests in Table below, determine which lock will be granted or blocked by the lock manager.
Does there exist a deadlock in the lock requests in given table, Explain why or why not.
To prevent, lock manager needs to adopt wait-die or wound wait policy. Determine which lock request will be granted, blocked or aborted in each case. Assume T1>T2>T3>T4 in terms of priority. [5]

Time	t1	t2	t3	t4	t5	t6	t7	t8
T1	S(A)		S(B)					
T2		X(B)						X(D)
T3				S(C)	X(D)		X(A)	
T4						X(C)		

[CO4] Q3. Write a trigger total_salary to maintain a derived column totsal that stores total salary of all members in a department (after each operation of insert, update or delete). [4]

[CO4] Q4. Consider the relational schema given below, where eid of relation dependent is a foreign key referring to empid of the relation Employee. Assume that every employee has atleast one associated dependent in the dependent relation.

Employee (empid, emp_name, emp_age)
Dependent (depid, eid, dept_name, dept_age)

Write the relational algebra and its equivalent SQL query.

a) Display employee ids of those employees who have at least one dependent with age greater than or equal to the employee's age. [3]
b) Display Emp ids of employees whose age is greater than that of all of his/her dependents. [3]
c) To insert new tuple into dependent relation. Is it allowed to insert new dependent information without having matching empid in employee relation? [3]

[CO5] Q5. Consider the relation R (A,B,C,D,E) with the following FDs:

$AB \rightarrow B,\ A \rightarrow C,\ CD \rightarrow E,\ B \rightarrow D,\ E \rightarrow A$

a) Find the minimal cover of R
b) What is the highest normal form the relation R satisfies? Convert it upto BCNF normal form. [4]

[CO5] Q6. Suppose, a relational schema R (v w x y z) and set of functional dependencies F and G are as follows:

$F: \{ w \rightarrow x,\ wx \rightarrow y,\ z \rightarrow wy,\ z \rightarrow v \}$
$G: \{ w \rightarrow xy,\ z \rightarrow wx,\ x \rightarrow v \}$.

Check the equivalency of functional dependencies F and G. [3]

[CO2] Q7. A university registrar's office maintains data about the following entities: (a) courses, including course number, Title, credits, syllabus and prerequisites (b) course offerings including course number, year, semester, section number, instructor(s), timings and classroom (c) students, including student_id , and name and program; and (d) instructors, including identification number, instructor_name, department and title. Further, the enrolment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modelled. Construct an ER diagram for the registrar's office.

Make the following assumptions:

- A Class meets only at one particular place and time. This ER diagram cannot model a class meeting at different places at different times.
- There is no guarantee that the database does not have two classes meeting at the same place and time.

Also, identify the weak and strong entity sets. [5]