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National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Advanced Database Concepts**	**Course Code:**	**CS451**
Program:	**BS(Computer Science)**	**Semester:**	**Spring 2017**
Duration:	**60 Minutes**	**Total Marks:**	**30**
Paper Date:	**21-Feb-17**	**Weight**	**12.5%**
Section:	**ALL**	**Page(s):**	**5**
Exam:	**Midterm-I**		

Instruction/Notes:

Q1. *(4 points)* Consider the university enrollment database schema:

Student (snum, sname, major, level, age) Class (name, meets_at, room, fid)
Enrolled (snum, cname) Faculty (fid, fname, deptid)

The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. For each of the following transactions, state the SQL isolation level (lowest possible) you would use and explain why you chose it.

a) Enroll a student identified by her snum into the class named 'Database Systems'.
b) Change enrollment for a student identified by her snum from one class to another class.
c) Assign a new faculty member identified by his fid to the class with the least number of students.
d) For each class, show the number of students enrolled in the class.

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Q2. *(10 points)* Consider the following classes of schedules: conflict-serializable, view-serializable, recoverable, cascadeless, and strict. For each of the following schedules, state which of the preceding classes it belongs to. If you cannot decide whether a schedule belongs in a certain class based on the listed actions, explain briefly. The actions are listed in the order they are scheduled and prefixed with the transaction name. If a commit or abort is not shown, the schedule is incomplete; assume that abort or commit must follow all the listed actions.

a) S1. T1:R(X), T2:R(Y), T3:W(X), T2:R(X), T1:R(Y)

b) S2. T2: R(X), T3:W(X), T3:Commit, T1:W(Y), T1:Commit, T2:R(Y), T2:W(Z), T2:Commit

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Q3. *(10 points)* Consider the following concurrency control protocols: 2PL, Optimistic, Basic Timestamp, Strict Timestamp, and Timestamp with Thomas Write Rule.
For the schedule S2. T2: R(X), T3:W(X), T3:Commit, T1:W(Y), T1:Commit, T2:R(Y), T2:W(Z), T2:Commit,
state which of these protocols allows it, that is, allows the actions to occur in exactly the order shown. Justify your answer.

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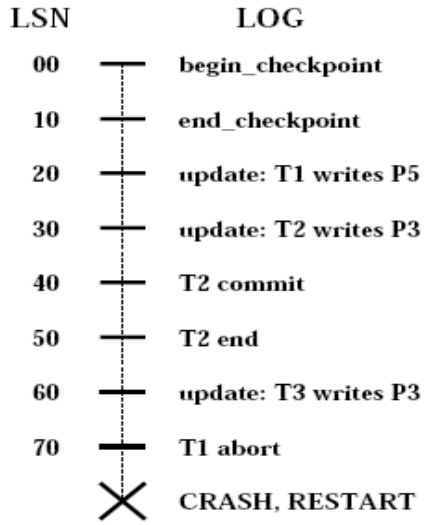
Q4. *(1+3+1+1= 6 points)* Consider the execution shown in below Figure. Assume that the Dirty Page Table and Transaction Table were empty before the start of the log.

a) What is the value of the LSN stored in the master log record?
b) What is done during Analysis? (Be precise about the points at which Analysis begins and ends and describe the contents of any tables constructed in this phase.)
c) What is done during Redo? (Be precise about the points at which Redo begins and ends.)
d) What is done during Undo? (Be precise about the points at which Undo begins and ends.)



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