End-Semester Examination, Autumn'2016

IT 214 Database Management Systems

Time: 2 hours

Max Points: 90

IMPORTANT NOTE:

1. Write answers neat and clean. Answers that are difficult to read may simply be discarded. Answers written using pencil will also be ignored.
2. Answer all parts of a question together at one place.
3. For every question, mark awarding strategy will be discrete (i.e., zero, half, and full)

1. Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability (precedence) graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

[15]

T1: r1(X); w1(X); r1(Y); w1(y);
T2: r2(Z); r2(Y); w2(Y); r2(X); w2(X);
T3: r3(Y); r3(Z); w3(Y); w3(Z);
S1: r2(Z); r2(Y); w2(Y); r3(Y); r3(Z); r1(X); w1(X); w3(Y); w3(Z); r2(X); r1(Y); w1(Y); w2(X);
S2: r3(Y); r3(Z); r1(X); w1(X); w3(Y); w3(Z); r2(Z); r1(Y); w1(Y); r2(Y); w2(Y); r2(X); w2(X);

2. Consider following schedule executed on postgreSQL. Find output, when both transactions are specified to execute at (i) READ COMMITTED (ii) SERIALIZABLE isolation levels. Assume that initial salary for employee with SSN ~~101~~ 123 is 50000.

[10]

```
T1: begin;
T1: update employee set salary = 60000 where ssn = 123;
T2: begin;
T2: select salary from employee where ssn = 123;
T2: update employee set salary=(select salary from employee where ssn=123)+5000
        where ssn = 123;
T1: commit;
T2: commit;
T1: select salary from employee where ssn = 123;
```

3. Consider scenario where I want to create a database of your groups doing project in this course, IT214. A number of students form groups for projects; a student cannot be in more than one group. For each group, I want to record GroupNo (Unique), Project Title, Student ID and Contact Number of the team leader. I would also like to record details of members in each team; i.e., student id, name and email of each student. Also suppose there are TAs in the course, and a number of groups are assigned to each TA. A group is supervised by a single TA. For TAs, I would like to record TA-Stud-ID, TA-Name, TA-email, and TA-Contact-Number.

The projects are evaluated at multiple stages on multiple parameters. At each stage, there are maximum marks for each parameter. Assume that each stage and parameters are determined by unique IDs; also set of parameters remain same at all stages of evaluation. Marks (out of max marks) for each student are recorded for each parameter and for each stage.

.... turn overleaf ....

Assume that scope of the proposed database is limited to this course, and this semester only; that means, I would not be adding more student groups to it when I take this course next time, possibly I would be emptying it out, and putting altogether new set of students and groups.

Determine following for the proposed database- [30]

a. Minimal Set of Function Dependencies
b. Normalized (BCNF) relational Schema.

4. Following relational schema for recording of state elections (from second in-semester examination). Note that the schema has few additional relations, and some reshuffle of attributes.

Constituency(ConstituencyName, Elected)
FK: **Elected** (candidate that wins election) refers to **Candidate**
Candidate(CandidateName, CandidatePartyName, AssetsDeclared)
Party(PartyName, PartyElectionSymbol, ProjectedCM)
FK: **ProjectedCM** refers to **Candidate**
Fights(ID, ConstituencyName, CandidateName, VoteCount)
FK: **CandidateName** refers to **Candidate, ConstituencyName** refers to **Constituency**
PollingBooth(BoothID, ConstituencyName, NoOfVoters, VotesCasted, District)
FK: **ConstituencyName** refers to **Constituency**
Votes(UUID, BoothID, VotedTo)
FK: **VotedTo** refers to **Fights, BoothID** refers to **PollingBooth**
You can assume that we have tuple in this relation only when a voter votes and vote is valid, that means it refer to a valid ID (exists in fights)

(A) Considering above schema, write **Relational Algebra** expressions for answering following queries (No marks will be awarded if answered in SQL) [20]

a. Polling percentage at each constituency (= total votes casted / NoOfVoters)
b. List candidates (Candidate Name, Constituency Name) who have won from more than one constituency.
c. Name of political party (PartyName, MLA_Count) having maximum number of candidates won.
d. List Candidates whose victory is more than 50000 votes.
e. Give Polling booth names where winner candidate in the constituency is looser (i.e. not having highest votes)

(B) Write a stored function (in pseudo code) **CountVotes**, that updates *VoteCount* attribute of Fights relation, VotesCasted in PollingBooth relation, and elected attribute in Constituency relation. [15]

In-Semester Test-4

IT 214 Database Management Systems

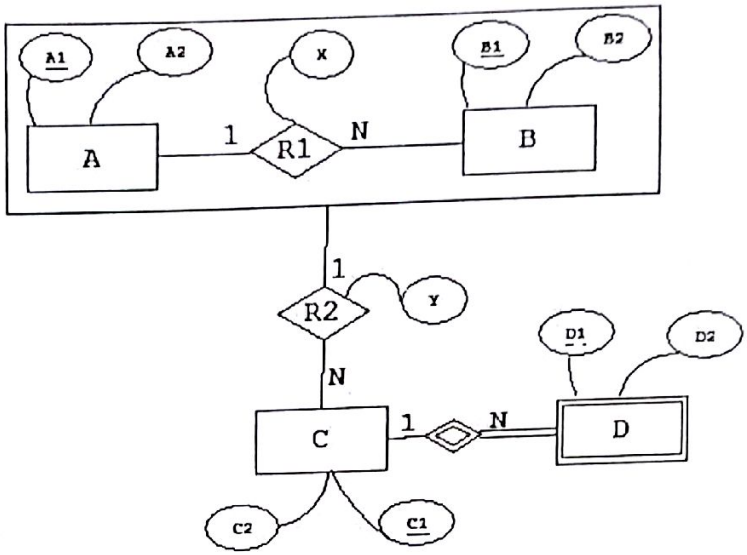
Time: 90 minutes

Max Points: 60

IMPORTANT NOTE:

1. Write answers neat and clean. Answers that are difficult to read may simply be discarded.
2. In every question, mark awarding strategy will be discrete (i.e., zero, half and full).

1. Consider following Entity Relationship Diagram. [10+10]



   a. Find out minimal set of FDs from semantics of attributes in given ER Diagram.
   b. Draw best possible normalized relational schema from the given ER diagram. Also indicate all candidate keys and foreign keys.

2. Suppose polling data of forthcoming assembly elections in Gujarat are to be recorded. Below are some terms that are used here-

Assembly Constituency: a political territory from where an assembly member is to be elected. Each constituency has definite set of voters.

Election Candidate: At each constituency various political party nominate their candidates in the election race. Normally there are many candidates fighting elections at a constituency. When polling starts, a voter votes to only one candidate. Once voting is done, counting is done, and candidate with maximum votes is declared as winner. The winner candidates is said to be an elected Member of Legislative Assembly (MLA) from that constituency.

Let us decide to record following data-

- For political parties: Name of party, party symbol, and name of projected chief minister.
- For constituency: Name, and Number of voters.
- For candidate: Candidate name, value of assets declared
- As counting is done, we record vote count for each candidate (for each constituency it fight at), votes casted in each constituency, and name of elected candidate for each constituency.

Assume: (1) constituency name and candidate names are unique; (2) One candidate belongs to only one party but can be candidate from more than one constituency. Also, one candidate can get elected from more than one constituency. [10+20]

   a. Draw ER Diagram for required database. Specify cardinality and participation constraints.
   b. Produce appropriate relational schema for the database. Try to have best possible normal form. Indicate keys, projected functional dependencies, and normal form of each relation.

3. Given following relations, and sets of functional dependencies.

[5+5]

R(ABCDE), FDs: {AB → C, B → D, C → E}
R(ABCDE), FDs: {A → B, BC → E, ED → A}

Do following-

(1) Compute all Key(s)

(2) Determine Normal Form

(3) Name FD (at least one) that violate requirement of immediate next higher normal form

(4) Normalize each of relation to highest possible normal form without losing any FD