CS 317: DBIS: Mid Semester Exam, 8 Sep 2016

Time: 11.00 AM – 1.00 PM   Marks: 50

Instructions: **Answer all parts of a question together.**
In case of any ambiguity, make any required assumptions, but state them clearly.

1. Suppose you have a relation *employee(ID, name, sal)* and another relation with salary increments (for some of the employees) *incr(ID, salincr)*. Note that no all employees may be getting an increment.

   Give an SQL update query that updates the *employee* relation to give each employee their salary increment. (If you don't recall the syntax of SQL updates, you can give a query using inserts/deletes.)   ...4

2. You are given a relation *packet(timestamp, from, to, byte)*, where timestamp is a value in milliseconds, which contains one tuple for each packet sent on a network. You need to compute the total number of bytes sent from each *from* address, in each 5 minute interval, starting from timestamp 1000 and ending at 2000.

   To do this, you will need a view that gives you all integers in a specified range.

   (a) Write a recursive view *myint(i)* that contains all integers in a range 0 to 199. To aid in this, you can assume a relation called *single* is available which has a single tuple in it (its schema and contents are irrelevant); note that SQL select clauses can have constants in them.   ...6

   (b) Use the above view *myint* to define the required aggregate. Note that intervals with no packets must have count 0.   ...4

3. You are given schema $r(A, B)$ and $s(B, C)$, where all attributes are integers, and queries

   ```
   Q1:  SELECT * FROM r  LEFT OUTER JOIN s ON (r.B = s.B)
        WHERE s.C > 5


   Q2:  SELECT * FROM r  LEFT OUTER JOIN s ON (r.B = s.B AND s.C > 5)
   ```

   Give a sample dataset where the queries Q1 and Q2 would give different results.   ...4

4. Normalization: Given the following functional dependencies on the relation schema $R(A, B, C, D, E, F, G, H)$:

   $$A \rightarrow B$$
   $$BC \rightarrow DE$$
   $$DE \rightarrow F$$
   $$AC \rightarrow F$$
   $$ABC \rightarrow G$$

   answer the questions below.

   (a) Is the schema $r1(A, C, E, G)$ in BCNF? If not, give a BCNF decomposition. Explain your answer.   ...5

   (b) Compute a canonical cover of the above set of dependencies. Explain the logic of each attribute/dependency that you drop.   ...7

5. You realize you have become increasingly forgetful of things to do; in fact, you have completely forgotten to do your share of work on the DBIS project.

   You and your project group members have divided up the project tasks, and need to track who is doing what, and when it is due. Tasks may have subtasks.

   You had therefore decided to create an app to track tasks. The app needs to store information about projects, tasks and subtasks, where each project has multiple tasks, which may have subtasks. Tasks may be shared by multiple projects, but subtasks are part of a single task. You must also track who is responsible for what aspect of each task/subtask. You now have to create an ER diagram for this app. Include the following information:

   (a) Persons

   (b) Projects

   (c) Tasks with information about deadlines and status (not started, started, completed)

   (d) Information about subtasks (subtasks are just like tasks, but are part of another task)

   (e) Persons responsible for each task or subtask, along with their responsibility (a text field)

   (f) Reviews, written by a person about the work of another person on a task. There can be multiple reviews for the same (reviewer, reviewee, task) combination.

   Add attributes to entities as required and provide appropriate constraints (e.g. cardinality/participation constraints).

   ...10

6. You are given temporal relations $r(A, B, from, to)$ and $s(B, C, from, to)$, where attributes *from, to* indicate the time period in which the tuple is valid, and $r.A$ and $s.B$ are primary keys of snapshots of the respective relations. Note that a tuple is valid from the time in *from*, till just before the timestamp in *to*.

   (a) Give pseudocode containing SQL statements for updating an r tuple with $r.A = 5$ by setting $r.B = 22$. You can assume a function *now()* which returns the current time.   ...5

   (b) Give an SQL query for computing the temporal join of r and s on $r.B = s.B$. You can assume function *range(from,to)* which returns a range, an operator && which returns a boolean indicating if two ranges intersect, an operator $*$ which returns the intersection of two ranges, and functions *lower(r)* and *upper(r)* which give the upper and lower bound of a range.   ...5

   Total Marks = 50