

**School of Information Technology
IIT Kharagpur**

Course Id: IT60113 Advanced Database Systems

Mid Sem

Date: September 20, 2007

Total Time: 2 Hours

Max. Marks: 60

Answer All Questions. Clearly state any assumption that you make.

1. Consider the following two Starburst active rules:

```
CREATE RULE SalaryControl ON Emp
  WHEN INSERTED, DELETED, UPDATED (Sal)
  IF (SELECT AVG(Sal) FROM Emp) > 100
  THEN UPDATE Emp
    SET Sal = 0.9*Sal
```

```
CREATE RULE LowPaid ON Emp
  WHEN INSERTED
  IF EXISTS (SELECT * FROM INSERTED
            WHERE Sal > 100)
  THEN INSERT INTO LowPaidEmp
    (SELECT * FROM INSERTED
     WHERE Sal < 100)
  FOLLOWS SalaryControl
```

Let the LowPaidEmp table be initially empty and the initial state of table Emp be as follows:

Employee	Sal
Amit	95
Rohit	90
Sudhir	105

Let a transaction adds two tuples (Sankalp, 138) and (Sunil, 98) in the table Emp.

- (a) Draw the triggering graph for the above set of rules. From the graph, can you determine if the termination condition will be achieved? If yes, why yes? If no, still do you think the termination condition will be achieved due to the rule semantics?
- (b) What will be contents of the two tables when the quiescent state is reached?
- (c) We want to maintain a summary table called TotalSalEmp containing total salary of all employees, which should always be consistent with the Emp table. Write suitable active rules for this purpose. You have to decide the number of rules you need and keep in mind that the above-mentioned two rules are already there in the database.
- (d) Show the contents of the TotalSalEmp table, had your rule(s) defined in (c) been there when the insert transaction was carried out. **[4+4+6+6=20]**

2. Consider a temporal database table be defined as follows.

```
CREATE TABLE Employee (Name CHAR(30), Salary INTEGER, Designation
                        CHAR(30))
AS VALID STATE DAY AND TRANSACTION
```

Assume that the table is initially empty and today (the date of your exam, i.e., 20/09/2007) you are inserting tuples in the table.

- (a) Write INSERT statement(s) to insert information about Amit whose salary is 2000 and his designation is Lecturer.
- (b) What would be the output of the Temporal SQL query *SELECT * FROM Employee* if (i) it is executed today after you inserted the row and (ii) it is executed on 24/09/2007
- (c) On 25/09/2007, you come to know that his salary has become 3000 from 25/09/2007 itself.
- What Temporal SQL statement would you write to put this information in the database?
 - Show the contents of the Employee table after you have executed your Temporal SQL statement.
 - What would be the output if you repeat the Temporal SQL query *SELECT * FROM Employee* after you executed your SQL statement in (i) of (c)?
- (d) On 10/10/2007, you realize that actually, the salary on Amit was supposed to be 2500 from 27/09/2007 till 05/10/2007.
- What Temporal SQL statement would you write to put this information in the database?
 - Show the contents of the Employee table after you have executed your Temporal SQL statement.
 - What would be the output if you repeat the Temporal SQL query *SELECT * FROM Employee* after you executed your SQL statement in (i) of (d)?
- [2+[2+2]+[2+2+2]+[2+3+3]=20]**

3. Consider the following two relations with some tuples. empmanager contains information about employees and managers. Only non-managers go out and make sales, which is captured in the empsales table.

empmanager

Name	Manager
Amit	Sudhir
Anant	Sudhir
Sunil	Nitin
Sudhir	Kaushik
Kaushik	Prasant
Nitin	Prasant

empsales

Name	Sales
Amit	1000
Anant	2000
Sunil	3000

- (a) In a step-by-step manner, develop a Datalog query which returns whether Nitin reports to Kaushik in the hierarchy. What is the output of the query?
- (b) Write a Datalog program to determine the persons who do not report to anybody. Is your program safe? If yes, why yes, If no, why no?
- (c) Consider that the direct sales of each non-manager (as in empsales) is considered to belong to that non-manager and his immediate manager only.

Explanation: It means that Amit's sales will be attributed to both Amit's (1000) as well as Sudhir's (1000). Similarly, Anant's sales will be attributed to both Anant's (2000) as well as Sudhir's (2000). Thus, Sudhir will be attributed two sales figures. There is no need to add them. Kaushik or Prasant will not be attributed any sales. It means that there is no recursion.

- Write a Datalog program to determine the sales that can be attributed to various employees.
- Convert the Datalog program into RA expression. **[5+5+[5+5]=20]**