**Database Systems Exam Practical**

Answer the following questions:

1. In the relation Employee below, the domain of ID is INT, EmpName is CHAR(20), NumChildren is INT.

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| **ID** | **EmpName** | **NumChildren** |
| 1 | Anupam | 3 |
| 2 | Boyd | 5 |
| 3 | Chang | 0 |
| 4 | Durai | 1 |
| 5 | Enrico | 2 |
| 6 | Fernando | 2 |
| 7 | Gorbachev | 4 |
| 8 | Heather | 2 |
| 9 | Inga | 8 |

1. In the relation Dependent below, the domain of DependentName is CHAR(20), Age is INT.

|  |  |
| --- | --- |
| **DependentName** | **Age** |
| Able | 3 |
| Heather | 5 |
| Wu | 10 |

1. Provide the results of the following operations. If an operation cannot be performed, state the reasons. Do not write the equivalent SQL statements.
   1. σNumChildren >= 2 AND EmpName LIKE '%a%'(Employee)
   2. ΠEmpName, NumChildren(Employee) - ΠDependentName, Age(Dependent)
   3. Employee U Dependent
2. Consider the following database to keep track of the calls routed through a phone carrier. The domain for area code, phone number, duration, and rate are INT. The domain for *CallStartTime* is TIMESTAMP. The domain of *Status* is CHAR(1) with values 's' to denote success and 'f' to denote failure. A row in the CALL table below captures the fact that a call was initiated at the *CallStartTime* from the phone number (*FromAreaCode*, *FromNum*) to the phone number (*ToAreaCode*, *ToNum*) and it lasted for *Duration* seconds. The per-minute rate for the call is specified in *Rate*. The status of the call is given in *Status*. An area code is something similar to a country-code or a city-code, only smaller. Thus, many area codes can serve a city. But, an area code can serve at most one city.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **CALL** | | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **FromAreaCode** | **FromNum** | **ToAreaCode** | **ToNum** | **CallStartTime** | **Duration** | **Rate** | **Status** | | 412 | 1000000 | 404 | 1000000 | 1989-10-17 18:03:03 | 10 | 3 | s | | 412 | 1000001 | 404 | 1000001 | 1989-10-17 18:23:03 | 0 | 3 | f | | 412 | 1000001 | 404 | 1000001 | 1989-10-17 18:33:03 | 0 | 3 | f | | 412 | 1000002 | 444 | 1000002 | 1989-10-17 18:03:03 | 10 | 3 | s | | 412 | 1000003 | 444 | 1000003 | 1989-10-17 18:23:03 | 0 | 3 | f | | 412 | 1000003 | 444 | 1000003 | 1989-10-17 18:33:03 | 0 | 3 | f | | 412 | 1000003 | 444 | 1000003 | 1989-10-17 18:43:03 | 10 | 3 | s | |

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| |  | | --- | | **LOCATION** | | |  |  | | --- | --- | | **AreaCode** | **City** | | 404 | San Francisco | | 618 | San Francisco | | 412 | Pittsburgh | | 724 | Pittsburgh | | 919 | Boston | | 444 | Los Angeles | |

1. Identify the primary key and alternate key(s). Substantiate your choice(s).
2. At 5:00 PM on 1989-10-17, an earthquake struck San Francisco and a number of people were trying to call relatives living there. At the phone company, when more than 50% of the calls to an area code result in a failure during an hour, that area code is considered to have a fatal error in that hour. Translate in SQL the following queries:
   1. Retrieve the number of calls initiated to each of the San Francisco area codes during each hour spanning a 10 hour duration (5 hours before and after the earthquake struck, i.e., from '1989-10-17 12:00:00' till '1989-10-17 22:00:00'). Sort the results by the volume of calls. Note that in PostgreSQL, the function EXTRACT(HOUR FROM CallStartTime) will yield the hour of CallStartTime. Note that in PostgreSQL, time constant can be specified within single quotes as in '1989-10-17 17:00:00'.

Find all the area codes that had a fatal error during the one hour period from 6PM to 7PM on the day of earthquake (which is '1989-10-17 18:00:00' to '1989-10-17 19:00:00').

**1、请将答案写在已“学号\_姓名.txt”命名的文本文件中，提交到ftp服务器“机试一”相应组别目录，按教务系统中归属的组别房间。**

**2、考试时间是15:30至17:30， 18:00是考试最后提交时间，之后提交的没有相应成绩，请同学注意提交时间。**