**MIDTERM EXAM**

**INFSCI 2710, Fall 2022 (6 questions)**

***1.* [24 pts]** Multiple Choice Grid *(Each multiple choice question may have NO, or MORE THAN ONE correct answer)*

*Multiple Choice Grid (6 questions)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | A | B | C | D | None |
| 2 | A | B | C | D | None |
| 3 | A | B | C | D | None |
| 4 | A | B | C | D | None |
| 5 | A | B | C | D | None |
| 6 | A | B | C | D | None |

*Circle none or more answers for each question in the grid provided above. Each circled wrong answer, or missed right answer will cost you a point.*

**1. A relational database system support \_\_\_\_\_\_\_\_\_\_\_**

1. referential integrity
2. class/subclass hierarchy
3. domain constraints
4. multi-valued attributes

**2. “not(10 < null)” will be evaluated by SQL to \_\_\_\_\_\_\_\_\_\_\_** a. a.true

1. false
2. uknown
3. null

**3. “10 = null or 10 < 0” will be evaluated by SQL to \_\_\_\_\_\_\_\_\_\_\_** a. a.true

1. false
2. uknown
3. null

**4. “10 = null and 10 < 0” will be evaluated by SQL to \_\_\_\_\_\_\_\_\_\_\_** a. true

1. false
2. uknown
3. null

**5. A key is not \_\_\_\_\_\_\_\_\_\_\_**

1. a set of attributes sharing the same value
2. a domain constraint
3. a unique identifier of a tuple
4. an attribute with the largest numeric value in the table.

**6. A foreign key is not \_\_\_\_\_\_\_\_\_\_\_**

1. an integrity constraint
2. a set of attributes sharing the same value
3. an attribute with the smallest numeric value in the table.
4. an attribute with the largest numeric value in the table.

1. **[14pt]** Write an SQL statements to create a relation *Message* with attributes *source, destination, day*, *media*, *sender*. Specify primary keys of this table for each of the following constraints:

* 1. a sender cannot send a message more than once per day
  2. a sender cannot send the same message more than once per day;
  3. a sender cannot send a message more than once;
  4. a message cannot be sent to the same destination more than once
  5. a message cannot be sent from the same source more than once;

**Your answer to problem 2 (please, specify keys only, no need to provide any explanation):**

**(a):**

*CREATE TABLE Message(*

*source* *VARCHAR(100),*

*destination VARCHAR(20),*

*day VARCHAR(10)*,

*media VARCHAR(20)*,

*sender VARCHAR(50) NOT NULL,*

*PRIMARY KEY (sender, day)*

**);**

**(b):**

*CREATE TABLE Message(*

*source VARCHAR(100),*

*destination VARCHAR(20) ,*

*day VARCHAR(10)*,

*media VARCHAR(20)*,

*sender VARCHAR(50) NOT NULL,*

*PRIMARY KEY (source, destination, day*, *media*, *sender)*

**);**

**(c):**

*CREATE TABLE Message(*

*source VARCHAR(100) ,*

*destination VARCHAR(20) ,*

*day VARCHAR(10)*,

*media VARCHAR(20)*,

*sender VARCHAR(50) NOT NULL,*

*PRIMARY KEY (sender)*

**);**

**(d):**

*CREATE TABLE Message(*

*source VARCHAR(100) ,*

*destination VARCHAR(20) ,*

*day VARCHAR(10)*,

*media VARCHAR(20)*,

*sender VARCHAR(50) NOT NULL,*

*PRIMARY KEY (destination)*

**);**

**(e):**

*CREATE TABLE Message(*

*source VARCHAR(100) ,*

*destination VARCHAR(20) ,*

*day VARCHAR(10)*,

*media VARCHAR(20)*,

*sender VARCHAR(50) NOT NULL,*

*PRIMARY KEY (source)*

**);**

1. **[14 pt]** Consider the following tables:

***department:***

|  |  |  |
| --- | --- | --- |
| *depname* | *budget* | *dmgr* |
| software | 5000 | null |
| hardware | null | null |
| sale | 1000 | 2222 |

***employee:***

|  |  |  |
| --- | --- | --- |
| *eid* | *ename* | *depname* |
| 1111 | Jones | null |
| 2222 | Smith | sale |
| 3333 | Brown | sale |

Plot a result table for each of the following SQL queries:

select *avg(budget)* ***result:***

from *department D*

|  |
| --- |
| *avg(budget)* |
| 2000 |

select *sum(D.budget)* ***result:***

from *employee E, department D*

where *E.depname = D.depname*

|  |
| --- |
| *sum(D.budget)* |
| 2000 |

select sum(*D.budget)*  ***result:***

from *employee E, department D* where *E.eid = D.dmgr*

|  |
| --- |
| sum(*D.budget)* |
| 1000 |

1. **[16pt]** Consider the university database:

**student***(snum, sname, major, level)*  **class***(cname, meets\_at, room, fid)*  **faculty***(fid, fname, depname)*

**enrolled***(snum, cname)*

Which of the following relational algebra expressions do not specify the most efficient way (out of the expressions in the following table) to find the names of all classes, in which students with IS major are enrolled:

表格

描述已自动生成

**Your Answer (please, specify only numbers of correct expressions, no explanation is required): (1)(4)**

1. **[16 pt]** Write an equivalent SQL query for each or the four algebraic expressions from the previous problem.

**Your Answer (please, specify only SQL queries, no explanation is required):**

|  |  |
| --- | --- |
| **(1)**  SELECT cname  FROM student, enrolled  WHERE student.major = ‘IS’  AND student.snum=enrolled.snum  ; | **(2)**    SELECT cname  FROM (SELECT \*  FROM student  WHERE student.major = ‘IS’) AS R1, enrolled  WHERE R1.snum=enrolled.snum; |
| **(3)**  SELECT cname  FROM (SELECT \*  FROM student  WHERE student.major = ‘IS’) AS R1,  (SELECT enrolled.snum  FROM enrolled)AS R2  WHERE R1.snum=R2.snum; | **(4)**  SELECT cname  FROM student,  CROSS JOIN enrolled  WHERE major = ‘IS’; |

1. **[16 pt]** Consider the university database:

**student***(snum, sname, major, level)*  **class***(cname, meets\_at, room, fid)*  **faculty***(fid, fname, depname)*

**enrolled***(snum, cname)*

Consider the query: “Find the names of all students who take classes in room 405”. Which of the following SQL expressions provide a correct answer for this query (there may be more then one or no SQL expressions correctly answering this query in the table below):

|  |  |
| --- | --- |
| select S.sname **(1)** from student S, enrolled E, class C  where C.room=405 | select S.sname **(2)**  from student S, class C, enrolled E where S.snum=E.snum and  E.cname=C.cname and  C.room=405 |
| select S.sname **(3)** from student S, class C, enrolled E, faculty F where E.cname=C.cname S.snum=E.snum and  C.fid = F.fid and  C.room=405 | select S.sname **(4)** from Student S, class C where S.major = C.cname and  C.room=405 |

**Your Answer (please, specify only the number of the correct SQL expressions, no explanation is required): （2）(3)**