

Student Name: Xiaoyu Xia

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 _____

- a. referential integrity**
- b. class/subclass hierarchy
- c. domain constraints**
- d. multi-valued attributes

2. “not(10 < null)” will be evaluated by SQL to _____ a.

- a.true
- b. false
- c. unknown**
- d. null

3. “10 = null or 10 < 0” will be evaluated by SQL to _____ a.

- a.true
- b. false
- c. unknown**
- d. null

Student Name: Xiaoyu Xia

4. “ $10 = \text{null}$ and $10 < 0$ ” will be evaluated by SQL to _____

- a. true
- b. false**
- c. unknown
- d. null

5. A key is not _____

- a. a set of attributes sharing the same value**
- b. a domain constraint
- c. a unique identifier of a tuple
- d. an attribute with the largest numeric value in the table.**

6. A foreign key is not _____

- a. an integrity constraint
- b. a set of attributes sharing the same value**
- c. an attribute with the smallest numeric value in the table.**
- d. an attribute with the largest numeric value in the table.**

Student Name: Xiaoyu Xia

2. [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:

- a) a sender cannot send a message more than once per day
- b) a sender cannot send the same message more than once per day;
- c) a sender cannot send a message more than once;
- d) a message cannot be sent to the same destination more than once
- e) 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):

PRIMARY KEY (sender, day)

(b):

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

(c):

PRIMARY KEY (sender)

(d):

PRIMARY KEY (destination)

(e):

PRIMARY KEY (source)

Student Name: Xiaoyu Xia

3. [14 pt] Consider the following tables:

department:

<i>depname</i>	<i>budget</i>	<i>dmgr</i>
software	5000	null
hardware	null	null
sale	1000	2222

employee:

<i>eid</i>	<i>ename</i>	<i>depname</i>
1111	Jones	null
2222	Smith	sale
3333	Brown	sale

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

select *avg(budget)*
from *department D*

result:

<i>avg(budget)</i>
3000

select *sum(D.budget)*
from *employee E, department D*
where *E.depname = D.depname*

result:

<i>sum(D.budget)</i>
2000

select *sum(D.budget)*
from *employee E, department D* where
E.eid = D.dmgr

result:

<i>sum(D.budget)</i>
1000

Student Name: Xiaoyu Xia

4. [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:

<p>(1)</p> $\pi_{cname}(\sigma_{major='IS'}(student \bowtie enrolled))$	<p>(2)</p> $\pi_{cname}(\sigma_{major='IS'}(student) \bowtie enrolled)$
<p>(3)</p> $\pi_{cname}(\sigma_{major='IS'}(student) \bowtie \pi_{snum}(enrolled))$	<p>(4)</p> $\pi_{cname}(student \times \sigma_{major='IS'}(enrolled))$

Your Answer (please, specify only numbers of correct expressions, no explanation is required): (3)(4)

Student Name: Xiaoyu Xia

5. [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):

<p style="text-align: center;">(1)</p> <pre>SELECT cname FROM student, enrolled WHERE student.major = 'IS' AND student.snum=enrolled.snum;</pre>	<p style="text-align: center;">(2)</p> <pre>SELECT cname FROM student WHERE major = 'IS' NATURE JOIN enrolled;</pre>
<p style="text-align: center;">(3)</p> <pre>SELECT cname FROM student NATURAL JOIN(SELECT snum FROM enrolled) WHERE major = 'IS';</pre>	<p style="text-align: center;">(4)</p> <pre>SELECT cname FROM student, CROSS JOIN enrolled WHERE major = 'IS';</pre>

Student Name: Xiaoyu Xia

6. [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 than one or no SQL expressions correctly answering this query in the table below):

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

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