

Example Midterm

True or False Statements:

- 1) A relationship is a property of an entity.
- 2) Weak entity set is an entity that cannot be identified uniquely without considering some primary key attributes of another identifying owner entity.
- 3) A relational database schema is a collection of relation schemas, describing one or more relations.
- 4) A relation degree is equal to the number of tuples within the relation.

Multiple choice questions with short open-ended responses:

- 1) In the schema customer(SSN, name, birth date, address, income), the following represent possible keys:
 - a) SSN
 - b) birth date, address, name
 - c) name, address
 - d) address, income

Which would you choose as a primary key? Briefly explain why?

- 2) What is a foreign key?
- 3) Why are constraints important in a relational database system?
- 4) Define these terms for a DBMS: atomicity, consistency, isolation, durability.

Modeling Problem:

Construct an E-R diagram for a car insurance company whose customers own one or more cars each. Each car has associated with it zero or more recorded accidents. For each customer we also want to model the neighborhood the customer lives in (affects insurance rates). The following information needs to be retrievable from this database: make and year of the car, customers' address and age, date and place of accidents, and insurance rate associated with a given neighborhood.

Please add any additional attributes that might be necessary in this diagram.

I expect you to clearly indicate primary keys, constraints, and the cardinality of the relationships in the diagram. Clearly describe the assumptions you made in constructing this diagram. Also, ensure your visual representation of 1-1, 1-m, and m-m cardinality ratios is well documented.

SQL Problem:

Use the following tables to answer the following SQL questions. The tables' schemas are:

```
BOAT(bid int, bname varchar(45), color varchar(20) )
RESERVES(sid int, bid int, day datetime)
SAILOR(sid int, sname varchar(40), rating int, age real(5,2))
```

1) Construct the natural join (the resultant set / tuples) for the following table instances:

<u>BID</u>	BName	Color
101	Interlake	blue
102	Interlake	red
103	Clipper	green
104	Marine	red
105	Interlake	red

<u>SID</u>	<u>BID</u>	DAY
22	101	10/10/96
58	103	11/12/96
31	102	01/01/01

<u>SID</u>	Sname	Rating	Age
22	Yuppy	9	35.0
58	Lubber	8	55.5
31	Guppy	5	35.0
59	Rusty	10	35.0

- 2) Write a SQL query that returns the number of times each boat name has been rented.
- 3) Write a SQL query that returns the list of sailors and the boat names they have rented. Do not duplicate boat names for a specific sailor. The result set consists of sailor name, boat id, boat name.
- 4) What does the following query return: `SELECT bname, color, count(*) FROM boats group by bname, color;`
 - a. Please provide the result set.

- 5) Write a SQL query that creates a new table YoungSailors where the tuples consist of the tuples from the Sailors table who are under the age of 18.
- 6) What does the following query return: `SELECT sid, color, count(*) FROM boats B JOIN reserves R on R.BID = B.BID group by sid, color;`
 - a. Please provide the result set.
- 7) What does the following query return:
`SELECT sname, bname, bid, color, COUNT(*) rentals FROM sailors S LEFT OUTER JOIN
(SELECT sid, bname, bid, color from boats B JOIN reserves R
ON R.BID = B.BID) BR
ON S.sid = BR.sid
GROUP BY sname, bname, bid, color`

Relational Calculus & Relational Algebra

Describe the results of the expression given the following schema. Convert the relational algebra expressions 1-3 and relational calculus formulas 4 to SQL.

boats(bid int,bname varchar(45),color varchar(20))
reserves(sid int, bid int, day datetime)
sailors(sid int, name varchar(45), age int, rating int)

- 1) $\pi_{name}(\text{sailors})$
- 2) $\sigma_{Sid > 31}(\text{sailors})$
- 3) $\text{sailors} \bowtie_{\text{sailor.sid} = \text{reserves.sid}} \text{reserves}$
- 4) $\{ \langle I, N, R, A \rangle \mid \langle I, N, R, A \rangle \in \text{sailors} \wedge N = \text{'Yuppy'} \}$

Write a relational algebra expression for the following sets:

- 5) The set of all boats that are blue
- 6) The name of all boats