**Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Directions:**

**You may use your textbook, notes, course assignments and internet resources. Submit your file as a word DOCX or PDF file. Check iLearn course page for deadline date and time.**

**You do not have a time limit for this exam. If you are well prepared it should take about 2 hours. You may use resources such as your computer, textbook and notes from the class. But do not get help from other people or give help to other students. Sign the honor pledge below.**

***I did not give or receive any unauthorized help in doing this exam. The exam is my own work.***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Sign your name above.***

|  |  |  |
| --- | --- | --- |
| **Problem** | **Possible**  **Points** | **Your Score** |
| 1-14  3 points each | 42 |  |
| 15 | 4 |  |
| 16 | 8 |  |
| 17 | 3 |  |
| 18 | 3 |  |
| 19-30  2 points each | 24 |  |
| 31 | 8 |  |
| 32 | 8 |  |
| Total | 100 |  |

**Multiple Choice. Indicate the single best answer.**

1. A relational database design for an entity with sub-type entities is done using
   1. single table, the extra attributes of the sub-type entity have NULL values
   2. multiple tables, one for the super-type entity, and one table containing the additional attributes of each sub-type
   3. using a 1:Many relationship between parent – child types.
   4. either option a or b will work.
2. Students enroll in one or more courses each semester. This is an example of
   1. One:Many relationship between entities STUDENT and COURSE.
   2. One:One relationship between entities STUDENT and COURSE.
   3. Many:Many relationship between entities STUDENT and COURSE.
   4. Weak entities.
3. Defining an index on a column will
   1. provide fast access for the predicate column =
   2. eliminate the need to sort records when there is an order by column
   3. provide fast access for column like ‘%value’
   4. all of the above
   5. a and b only.
4. A column can be defined with the NULL attribute to indicate
   1. a data value is missing
   2. the attribute is not applicable to this entity.
   3. a default value should be inserted by the DBMS.
   4. A and B
   5. A, B and C.
5. Dirty read is
   1. Reading data that was previously changed in the same transaction.
   2. Reading data that been committed by another transaction but has not been written to the log yet.
   3. Reading data that was modified by another transaction before it was rolled back.
6. Nonrepeatable read is
7. Reading data and then later in the same transaction finds that the record has changed.
8. Two requests read the same record and get different values.
9. A request reads a record and then commits. It later reads the record again and finds that it has changed.
10. The names of the ANSI isolation levels, in order from least to most restrictive are
    1. dirty read, non repeatable read, phantom read
    2. serializable, repeatable read, read committed
    3. read committed, repeatable read, serializable
    4. auto commit, read commit, repeatable read, serializable
11. The payroll department accidentally runs the wrong payroll database update program on Friday at 2:00pm The error is caught a few minutes after the program has terminated normally. The best way to recover from this error is
    1. restore the database to the last backup
    2. restore the database to the last backup and apply all log records since the backup
    3. restore the database to the last backup and apply all log records between the last backup and Friday 1:59pm just before the erroneous updates.
    4. tell the payroll department that it is too bad and nothing can be done.
12. You attempt to recover a database using the latest backup but find the backup file is corrupted. What can do you?
    1. Nothing. The data is lost.
    2. Use the next latest backup and use all logs since that backup.
    3. Don’t worry. The DBMS will automatically use the logs to repair the corrupted backup.
13. On Friday at 2:46pm there is an power failure and the database server stops. When power is restored what should you do?
    1. Restore all database to the last backup and apply logs.
    2. Do nothing. The DBMS will automatically recovery all committed transactions and undo any uncommitted transactions.
    3. You need to use the logs to undo any uncommitted changes to the data.
    4. You need to use the log to redo committed changes that were buffered in RAM and not written to the hard drive.
    5. You need to do both C and D using the appropriate command.
14. SQL views can be used to
    1. create virtual tables that are summaries of data tables.
    2. hide columns from a user
    3. hide rows from a user
    4. provide additional security that a user can only select or update certain columns or rows in a table that contain their user id.
    5. B and C and D only.
    6. All of A, B, C and D.
15. If I want to allow user1 to read and update the jrj.customer table I would do the following sql
    1. grant update on jrj.customer to ‘user1’@’%’
    2. give read, write on jrj.customer to ‘user1’@’%’
    3. grant select, update on jrj.customer to ‘user1’@’%’
    4. give select, update on jrj.customer to ‘user1’@’%’
16. What does the “WITH GRANT” keyword do on an SQL DCL statement
    1. give all privileges owned by the user to another user
    2. give specified privileges to another user and allow that user to give them to other users
    3. give DBA administrator privileges to the user
    4. gives administrator privileges to another user but only for the specified table
17. Given the following table and data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Key | LastName | Rank | Room | Shift |
| 1 | Smith | Manager | 34 | AM |
| 2 | Johnson | Custodian | 33 | PM |
| 3 | Smith | Custodian | 33 | Evening |
| 4 | Doe | Clerk | 222 | AM |

Which is a candidate key for this data?

* 1. LastName
  2. Room
  3. Shift
  4. {Rank, Room}
  5. {Room, Shift}

**Short Answer– answer with a few well written sentences.**

1. Isolation

A web program does the following operations

start transaction

set isolation level = repeatable read

select count from inventory where partno = ?

update inventory set count = ? where partno = ?

commit

The DBMS uses MVCC (multi version concurrency control). The program occasionally receives an SQL error from the update statement when another concurrent request for the same partno is executing. What could be done to avoid this error?

1. Atomic.
   1. What does the term “atomic” mean in database processing?
   2. Why is it important that program work in an “atomic” manner?
   3. What is the php statement that is used to start a transaction in mysql?
   4. What is the php statement that will terminate a successful transaction in mysql?
2. Give an example of a lost update problem?
3. Specify the SQL CREATE TABLE statements that would be used to implement the following E-R model . Specify primary and foreign keys constraints. Specify appropriate data types and NULL or NOT NULL properties for each attribute.



1. A hard drive containing database JRJ crashes and all data is lost. Briefly describe what you would do. You do not have to give specific MySQL commands, but you have to indicate the steps.

**If you need to create (or recreate) the Art Course tables for questions 20 - 29, use the file from iLearn**

* **FinalExam Art Course Tables.sql**

1. What are the names of the tables created in the art course database?
2. What are the names of the columns in the enrollment table?
3. What is the datatype of the course.CourseDate column?
4. Describe the type and cardinality of the relationships among the Course, Customer and Enrollment tables.
5. What are the primary and foreign keys in the enrollment table?
6. If Course with CourseNumber 1 was deleted from the Course table, would this delete be successful?
7. What changes would occur in the Enrollment table when courseNumber 1 was deleted?
8. If I wanted to prevent the deletion of a course that had active enrollments, what changes would I make to table definitions?
9. Is it possible to change the value of a primary key with an update statement? What effect does this have on the foreign key values in other tables?

MySQL supports date-time arithmetic. You can do arithmetic on dates and intervals. Examples are

select curdate();

select curdate() + interval 1 week;

select curdate() – interval 3 day;

More information can be found at

<https://dev.mysql.com/doc/refman/5.5/en/date-and-time-functions.html>

Study the add\_date and date\_diff functions. Also see

<http://www.mysqltutorial.org/mysql-interval/>

for examples of interval values.

update the start dates of all courses with the sql statement

update course

set course date = coursedate + interval 3 year - interval 3 week;

The completion message should indicate that 5 rows were changed.

1. Write an sql SELECT that return courses that start within the next 6 weeks from now. [ The answer should be courseNumber 3].

Given a table of biology facts about animals and their habits (the following table shows a portion of data from the table)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Key | CommonName | Class | Eats | LifeExpectancy |
| 1 | Cat | Mammal | mice | 15 |
| 2 | Cat | Mammal | milk | 15 |
| 3 | Bear | Mammal | fish | 30 |

1. Discuss whether this table is normalized? Explain your reasoning.
2. Given the table of biological facts above, write a select statement for
   1. Find all animals that eat fish.
   2. Bears only eat fish. What is the select statement and what would be the expected answer be to show this statement is TRUE?
   3. What do cats eat?
   4. What select statement and result would show that no animal eats sharks is true?

**Essay**

1. Describe in a few well written paragraphs recent trends in databases. Include in your answer what the terms Data Warehouse, ETL, Star-Schema, NoSQL, Hadoop, Distributed Databases, and how they are used on real world applications.

**Feedback**

You are given many surveys during this course to give feedback. Here is one more. But please do take a few minutes to do this one.

**Assignments (indicate the assignment numbers for the following 3 questions)**

* Of the 13 assignments and the project in the course, I learned the most from *\_\_\_\_\_\_\_\_\_\_\_.*
* The assignment(s) which I feel were least beneficial to me where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Agree or Disagree** The feedback I received on assignments, quiz and exams was useful and helped me to learn.

**Agree or Disagree** The grading of assignments, quiz and exams was fair.

**Agree or Disagree** Writing a learning journal entry every week helped in my learning for this course.

**Any other comments you want to make: either positive or negative about anything in this course? Your feedback will help me to improve the course.**