

Answer each question carefully on the paper provided. There are 12 questions worth 100 points. Point values are given in parentheses to the right of each question. There are no essays on this exam. Be complete, but be concise.

1. List two ways in which a spreadsheet file is a database and two ways that it is not. (6)

2. A certain company keeps track of the abilities and qualifications of its programmers in a simple table that has the following attributes:
 - ID : Employee identification number (unique to the employee)
 - NAME: Employee's name
 - DEGREE: Academic degree held by an employee (each employee may have multiple degrees)
 - LANGUAGE: Programming language known by the employee (each employee may know multiple programming languages).
 - a. Give an example of the kind of problem that can occur with this single table design. (4)
 - b. List any functional dependencies among the attributes. (4)
 - c. Decompose this table into a set of tables that are in BCNF. (6)

3. Give an example of a relation that contains a multivalued dependency that is NOT also a functional dependency. (4)

4. Show that any relation with exactly two attributes is in BCNF. (8)

5. Database normalization is the process of decomposing relations into relations that conform to the rules of some normal form. Is it ever appropriate to "denormalize" that database? How can this be done? (4)

6. Describe one use for a view (4)

7. Suppose a database system has two transactions T1 and T2 that operate on tuples s and t. Tuple s has an attribute A (called s.A) and tuple t has an attribute B called t.B. The actions performed by the two transactions are in pseudo-code below:

T1	T2
1. read s.A	1. read t.B
2. read t.B	2. read s.A
3. write s.A = s.A + t.B	3. write t.B = s.A + t.B

Suppose s.A is initially 300 and t.B is initially 500.

- a. What are the values for s.A and t.B after T1 and T2 executed serially? (4)
- b. Show how T1 and T2 can produce incorrect results if run concurrently. (6)

8. Suppose a computer serving a database loses power during a transaction. What must be done to recover the database? (4)

- 9. a. What is a referential integrity constraint? (4)
- b. Describe two possible actions a database can take when there is a referential integrity violation. (6)

10. What is a candidate key and what does it tell you about functional dependencies? (4)

11. Write the following queries from the movie database. The Movie database tables are attached. (3 each)

- a. Get the title and year of every movie.
- b. Get the title and year of every movie since 2000.
- c. Get the title and year of every movie in the 1990's.
- d. Get the roles of all actors from the 1986 movie 'Labyrinth' .
- e. List the names of all of the people who are writers and all of the people who are directors.
- f. The 2007 movie 'I am legend' was a remake of the 1964 movie 'Last Man on Earth'. Add this information to the IsRemake table. (You may assume the movies already exist in the Movies relation.)

12. You are building a web application constructed of many JSPs. You want to incorporate a "favorites" feature that stores a list of a user's favorite pages on your site. A favorite place may contain search results found by the user. Answer each of the following questions for this feature. You may use pseudo-code instead of correct JSP or SQL syntax.

- a. What database table or tables will be required to support this feature? (4)
- b. What must the web application do to add a page or search result to the favorites list? (5)

c. What must the web application do to allow the user to view one of the favorites? (5)