

**ITEC 3335 Database Development**  
**Fall 2017**  
**Final Examination**

**Last Name:** \_\_\_\_\_ **First Name:** \_\_\_\_\_ **Student Id:** \_\_\_\_\_

**Number:** \_\_\_\_\_

Time allowed: two hours. Total score: 100 points. *Closed* book examination but a ‘cheat’ sheet allowed. Answer all questions.

**Academic honesty policy will be followed strictly. Cheating will be pursued vigorously and will result in a failing grade of D or below, a permanent academic record, and possibly other more serious penalty.**

(1) [26 points] True or False. Circle one.

- (a) [ T or F ] In Tableau, a *measure* usually has a string value.
- (b) [ T or F ] In Tableau, one can add trend lines to a *measure* in selected visualization options in the data view.
- (c) [ T or F ] In MySQL, the INSERT statement is an example of a DDL command.
- (d) [ T or F ] In MySQL, it is not possible to explicitly insert a null value to a column using the INSERT statement.
- (e) [ T or F ] In MySQL, the system catalog is stored in a proprietary non-relational manner.
- (f) [ T or F ] PHPMyAdmin is a Web-Based tool for administering MySQL.
- (g) [ T or F ] In Python, indentation is optional.
- (h) [ T or F ] In functional dependencies, if  $A \rightarrow B$ ,  $A \rightarrow C$  and  $BC \rightarrow D$ , then  $A \rightarrow D$ .
- (i) [ T or F ] It is possible for a relation to be in BCNF but not in 3NF.
- (j) [ T or F ]  $R(A,B,C,D)$  with  $\{A \rightarrow BC, C \rightarrow D\}$  is in 3NF.
- (k) [ T or F ] PyMySQL is a vendor-specific DB API.
- (l) [ T or F ] In MySQL, an account is uniquely defined by the column ‘user’ in the ‘user’ table of the system catalog.
- (m) [ T or F ] If AB is a superkey in  $R(A,B,C,D,E)$ ,  $AB \rightarrow D$ .

(2) [15 points] Consider the following relation:

Supply(SupplierId, SupplierName, ProductId, ProductDesc, Quantity, ArrivalTime)

The relation stores the quantities and arrival times of shipments of products (identified by ProductId) from suppliers (Identified by SupplierId). A supplier may not have a unique name. Furthermore, the product description, ProductDesc, may be the same for two products. A supplier may supply the same product many times, each with a different ArrivalTime.

(a) Identify the functional dependencies (FD) of the relation.

(b) What are the candidate key(s)?

(c) What are the non-prime attributes?

(d) What is the highest normal form of the relation? Why?

(e) If it is not in BCNF, convert the relation to relations of BCNF or 3NF.

(3) [24 points] Using the Toy University (toyu) database in the supplementary sheet, provide the SQL statements for the following queries. The detailed requirements are highlighted by the results below.

(a) List the names of faculty members and the numbers of classes they teach (not including those not teaching a class).

faculty (3×9)		
lname	fname	numClasses
Smith	Paul	3
Love	David	2
Mannes	Sharon	2
Bajaj	Katrina	2
Allister	Art	1
Yu	Benjamin	1
Kim	Daniel	1
Byre	Andrew	1
Tran	Mary	1

Ordered by the number of classes the faculty teach.

(b) List the names of faculty members and the numbers of their advisees. Include only assistant professors with more than one advisees in the result.

faculty (3×1)		
lname	fname	numAdvisees
Allister	Art	2

Only Art Allister is an assistant professor and advises more than one students.

(c) List the faculty names who teach at least one class but do *not* advise any student.

Result #1 (2×5)	
faculty	numClasses
Katrina Bajaj	2
David Love	2
Mary Tran	1
Andrew Byre	1
Benjamin Yu	1

Ordered by the number of classes taught in descending order

One column named 'faculty' stores the first and last name of the faculty

(d) List the names of students who have enrolled in at least one class taught by faculty with id 1011, and also at least one class taught by faculty with id 1012.

student (2×2)	
fname	lname
Tony	Hawk
David	Hawk

Only two students have taken courses from both faculty 1011 and 1012.

(4) [20 points] Write a simple Python program, t2.py, to connect to the database **toyu**, to show the information about students in a particular major in a format as shown by the example below. The command line argument accepted by the program is the department code of the major. For example:

```
C:\...>python t2.py ITEC
Student in the major ITEC:
-----
Larry Johnson [id #100004]: advisor: Deborah Gump.
Catherine Lim [id #100003]: advisor: Deborah Gump.

C:\...>python t2.py CINF
Student in the major CINF:
-----
Linda Johnson [id #100005]: advisor: Daniel Kim.
Lillian Johnson [id #100006]: advisor: Daniel Kim.
```

You program can use the following Python program to make the MySQL connection to the toyu database.

dbconfig.py:

```
import configparser

# simplistic and no error handling.
def get_mysql_param(filename='dbconfig.ini', section='mysql'):

    config = configparser.ConfigParser()
    config.read(filename)

    return config['mysql']
```

A skeleton is provided for you:

```
from dbconfig import *
import pymysql

# establish database connection to the Toy University DB.
db = get_mysql_param()
cnx = pymysql.connect(user=db['user'], password=db['password'],
                      host=db['host'],
                      database=db['database'])

# Your code here.

# Answer in the next page.

cnx.close()
```

**Answer of (4):**

(5) [15 points] Consider the following table in an *activity score report* for a day care center:

**Activity Score Report**

Activity: Easter Run, on April 16, 2017

Number of participants: 4

ChildId	ChildFName	ChildLName	JoinSince	Score
C1	Mary	Smith	1/1/2017	3
C2	Paul	Law	6/5/2016	4
C3	Albert	Lee	6/1/2015	2
C4	Flora	Johnson	1/15/2015	5

The *ChildId* is a unique identifier of a child. The column *JoinSince* is the date a child joined the center. The column *score* is the child's score in the activity, e.g. 'Easter Run.'

(a) Design a minimal set of tables (and their columns) in at least 3NF to store the necessary information for the report.

(b) List the functional dependencies of each table.

(c) State the highest normal form (up to BCNF) of each table.