Seat No. .....

Student ID. .....

King Mongkut's University of Technology Thonburi

CPE332 Database and ERP Systems — Department of Computer Engineering, Faculty of Engineering

Final Exam 1/2015 — Thursday, November 26th, 2015, 13:00-16:00

(For CPE and AE students)

Your Name .....

Please read the following directions and notes:

- Write your ID on every page of the exam. Write your name just on this cover page.
- No books, calculators, and computers are permitted.
- Answer each question completely, clearly, concisely, and precisely.
- There are 12 questions, 90 points, and 5 parts (22, 20, 20, 13, and 15 points in each part respectively).
- Do not take the exam paper out of the room.

This exam has been approved by the Department of Computer Engineering.

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Part I: Normalization [22 points]

1. Consider the below table. One student can be a member of one project; however, we assume that student information (i.e., StudentNo and StudentName) will be separated into a table for later use. Then, normalize the table until it meets the requirements of 3NF (Third Normal Form). What are the requirements of 3NF? Show the ER-diagram of the normalized database. [12 points]

ProjectCode	**ProjectName**	**StudentNo**	**StudentName**	**Grade**	**AdivisorNo**	**AdvisorName**
A1	A multi-hop wireless network for smart farming	54000001	Suwit Jaidee	A	AD001	Dr.John White
		54000045	Manee Jairai	A		
A2	A mobile volunteer computing platform for ALICE at CERN	54000011	Peter Parker	B+	AD001	Dr.John White
A3	Big data analysis for a pharmaceutical company	54000087	Harry Potter	D+	AD002	Dr. Severus Snape
A4	A chatting application for couples on Apple Watch	54000004	Katniss Everdeen	B	AD002	Dr. Severus Snape
		54000051	Peeta Mellark	C+	AD001	Dr.John White
A5	An intelligent coffee tumbler: how much caffeine I get	54000002	Paul Smith	C	AD003	Dr.Phond Phunchongharn

2. Consider the following relation in the below table. It contains information on books published by printed. Each book has an ID, a title, a publisher, an edition number, the number of pages, year published, and authors. Moreover, we have the following information on the attributes: [6 points]
   - For each book, a same edition of the book (represented as a number) can be printed and published in multiple years.
   - A new unique ID is assigned to a book if a new edition of the book is published.
   - One author may write one or more books.

ID	Title	Publisher	Edition	NumPages	Year	Author
1	Advanced Computer Architecture	Pearsoon	1	123	2013	J.K. Rooling
2	Introduction to Big Data	Weeleys	3	200	2015	Matthew Deans
2	Introduction to Big Data	Weeleys	3	200	2015	Sally Reimer
4	Parallel and Cloud Computing	IEEEE	1	500	2013	Ekram Hossain
1	Advanced Computer Architecture	Pearsoon	1	123	2014	J.K. Rooling
5	Advanced Computer Architecture	Pearsoon	2	145	2014	J.K. Rooling
6	UX and UI: How to be a good designer	ApplePublisher	2	500	2014	J.K. Rooling
7	Parallel and Cloud Computing	Pearsoon	1	508	2013	P. Phond

1) Based on the table, indicate for each of the following sets of attributes (columns) whether it is a key. Answer "Yes" if it is a key and "No" if it is not. [2.5 points]

   You will get 0.25 points for each correct answer and 0 points for no answer. However, your total points will be deducted by 0.25 points for each wrong answer.

   _____ {ID}

   _____ {Author}

   _____ {Title}

   _____ {Author,Publihser}

   _____ {ID,Title}

   _____ {Title, Edition}

   _____ {ID,Author}

   _____ {Title, Year}

   _____ {ID, Title, Year}

   _____ {ID, NumPages, Year}

2) Next answer each potential functional dependency below whether it is indeed a functional dependency or not. Answer "Yes" if it is a key and "No" if it is not. [2.5 points]

   You will get 0.25 points for each correct answer and 0 points for no answer. However, your total points will be deducted by 0.25 points for each wrong answer.

   _____ ID→Title

   _____ Author→Title

   _____ Edition→Year

   _____ {ID,Edition}→Publisher

   _____ {ID,Title}→NumPages

   _____ Title→Author

   _____ Title→ID

   _____ {Title, Year}→ID

   _____ ID→Title, Publisher, Edition

   _____ {ID, Title}→Year

3) If there are partial dependencies in the previous question, list which functional decencies are partial dependencies and also make them to be fully functional dependencies. [1 point]

3. Consider the below table, answer the questions. [4 points]

TBL_SONG

Song ID (PK)	Song Title	Genre ID	Gerne Type	Price
1	You Belong with Me	1	Pop	3.00
2	Bad Day	1	Pop	3.25
3	Dance Tonight	2	Folk	4.00
4	Respect	3	R&B	3.00
5	Seasick	4	Rock	3.25
6	Let's Stay Togeteher	3	R&B	4.00

(PK) – Primary key

TBL_PURCHASE

Cutomer ID (PK)	Store ID (PK)	Store Location
1	1	Bangkok
1	2	Chaing Mai
2	1	Bangkok
3	1	Bangkok
4	3	Phuket

(PK) – Primary key

For questions 1) and 2), you will get 0.25 points for each correct answer and 0 points for no answer. However, your total points will be deducted by 0.25 points for each wrong answer.

1) List which table(s) meets the 2NF requirements? [0.25 points]

2) List which table(s) meets the 3NF requirements? [0.25 points]

3) Is there any transitive dependency in TBL_SONG? If yes, answer what it is and how to remove it. After removing it, what Normal Form do we meet its requirements? [2 points]

Part II: SQL-Data Definition [20 points]

4. Answer the following sub-questions below. All statements used to answer the following questions must be based on MySQL.[8 points]

1) Use SQL statement to create a table named TBL_USERACCOUNT according to the structure given below. Note that "_id" is the primary key of the table. [4 points]

#	Name	Type	Collation	Attributes	Null	Default	Extra
1	_id	int(11)			No	None	AUTO_INCREMENT
2	email	text	utf8_general_ci		No	None	
3	password	text	utf8_general_ci		No	None	
4	verify	int(11)			No	None	
5	code	text	utf8_general_ci		No	None	
6	title_name	text	utf8_general_ci		No	None	
7	first_name	text	utf8_general_ci		No	None	
8	middle_name	text	utf8_general_ci		Yes	NULL	
9	last_name	text	utf8_general_ci		No	None	
10	address	text	utf8_general_ci		Yes	NULL	
11	city	text	utf8_general_ci		Yes	NULL	
12	postal_code	text	utf8_general_ci		Yes	NULL	
13	country	text	utf8_general_ci		No	None	

2) Show a **single** statement to remove the "verify" and "code" columns from the table. [1 point]

3) Show a statement to change the column name from "_id" to "account_id". [1point]

4) Show a statement to change the primary key from "account_id" (formerly "_id") to "email". [1 point]

5) Assume that there is another table named "TBL_REGISTRATION" which is used to collect all users' registration information. In TBL_REGISTRATION, there is also a column named "account_id". Show a statement to add a foreign key constraint on the "account_id" column of "TBL_REGISTRATION" which points to "account_id" of "TBL_USERACCOUNT". [1 point]

5. Answer the following questions. There may be multiple correct answers in each question. You will get 1 point in that question if you choose all the correct answers; otherwise, your total points will be deducted by 0.25 points and you will get 0 points for no answer. All statements used to answer the following questions are based on MySQL statements [5 points]

1) What is the following statement used for?

```
SELECT COLUMN_NAME, CONSTRAINT_NAME, REFERENCED_COLUMN_NAME,
REFERENCED_TABLE_NAME FROM information_schema.KEY_COLUMN_USAGE
where TABLE_NAME = 'TBL_USERACCOUNT;
```

a. Select data from the table TBL_USERACCOUNT
b. Select data from the table information_schema.KEY_COLUMN_USAGE
c. Add a foreign key constraint to TBL_USERACCOUNT
d. Get column names, constraint names, referenced column names, and referenced tables in TBL_USERACCOUNT
e. No correct answer

2) What is a statement for selecting an existing database? Assume we are going to select the database named "cpe332".
   a. select cpe332;
   b. show cpe332;
   c. use cpe332;
   d. pick cpe332;
   e. The database will be automatically selected when we use a Select statement to select data from the tables. Do not need to execute any statement before.

3) If the datatype of "_id" is set to be int(11), which answer(s) is(are) correct?
   a. The maximum value of _id is 2^4 for unsigned integer.
   b. The total number of possible values of _id is 2^{11}
   c. The total number of possible values of _id is 2^{32}
   d. Only 11 characters to display when selecting data with the MySQL command line client.
   e. The size of _id is 11 bytes.

4) Which statement(s) can be used to change the datatype of "status" column in TBL_PAPER from text to a new datatype that can keep values; true or false?
   a. ALTER TABLE TBL_PAPER CHANGE `status` `status` boolean;
   b. ALTER TABLE TBL_PAPER CHANGE `status` `status` tinyint(1);
   c. ALTER TABLE TBL_PAPER MODIFY `status` tinyint(1);
   d. ALTER TABLE TBL_PAPER DROP `status`; ALTER TABLE TBL_PAPER ADD `status` boolean;
   e. ALTER TABLE TBL_PAPER MODIFY `status` boolean;

5) In TBL_PAPERAUTHOR, there are existing columns named "paper_id" and "account_id". "paper_id" has already been defined as the primary key of the table. Then, if you would like to have both "paper_id" and "account_id" as primary key (a composite key defined as a primary key). Assume that now there is no data in the table. Then you execute the following statement.

ALTER TABLE TBL_ PAPERAUTHOR ADD PRIMARY KEY (*`account_id`*);

What is the result after executing the statement?

a. Both the columns are now set as the primary key of the table.
b. Only "account_id" is now the primary key.
c. You get an error "Multiple primary key defined".
d. You get a wrong syntax error.
e. Only "paper_id" is now the primary key.

6. Suppose that the TBL_ PAPERAUTHOR table was created as follows:

```
CREATE TABLE TBL_ PAPERAUTHOR (
'paper_id' INT REFERENCES TBL_PAPER(paper_id) ON DELETE SET NULL,
'account_id' INT REFERENCES TBL_ACCOUNT(account_id) ON DELETE CASCADE,
'status_id' TINYINT(1) REFERENCES TBL_ STATAS(status_id)
);
```

Answer "True" if which of the following statements is true and "False" if it is flase.You will get 1 point for each correct answer and 0 points for no answer. However, your total points will be deducted by 1 point for each wrong answer. [7 points]

1) If we try to delete a row (tuple) from the table, the row is not deleted. Instead, paper_id is set to NULL.

2) If we delete a row from the table, any rows in TBL_ACCOUNT referred to by this row are also deleted.

3) If we delete a row from TBL_PAPER, some attributes of TBL_ PAPERAUTHOR may have their values set to NULL.

4) If we try to insert a row into TBL_ PAPERAUTHOR, with an account_id that does not exist in TBL_ACCOUNT, the operation is rejected.

5) If we try to insert a row into TBL_ACCOUNT, with an account_id that is not referred to in TBL_ PAPERAUTHOR, the operation is rejected.

6) If we try to delete a row into TBL_STATUS and there is a related foreign key value in the TBL_ PAPERAUTHOR, the operation may be rejected.

7) Assume that we set the foreign key constraint of "status_id" as

'status_id' TINYINT(1) REFERENCES TBL_ STATAS(status_id) ON DELETE NO ACTION

If we try to delete a row into TBL_STATUS and there is a related foreign key value in the TBL_ PAPERAUTHOR, the operation may be rejected.

Part III : PHP Web Programming and Databases [20 points]

7. Answer the following questions. You will get 0.5 points for each correct answer and 0 if you do not answer. Your total points will be deducted by 0.25 points (i.e., -0.25) if your answer is wrong. [5 points]

1) How do you write "Hello World" in PHP?

a. Document.Write("Hello World");
b. echo "Hello World";
c. "Hello World";
d. System.out.println("Hello World");
e. printf("Hello World");

2) PHP server scripts are surrounded by delimiters, which?

a. <&>...</&>
b. <?php>...</?>
c. <?php ... ?>
d. <script>...</script>
e. <$php ... $>

3) What is not a correct way to add a comment in PHP?

a. /* comment */
b. # comment
c. // comment
d. <!--comment -->
e. All the above answers are correct ways.

4) Which one of these variables has an illegal name?

a. $1_myvar
b. $myvar1
c. $_my_var_1
d. $my_var1
e. $MYVAR

5) Which one of the statements below is the correct JavaScript syntax to change the content of the HTML element below?

This is a demonstration.

a. #demo.innerHTML = "Hello World!";
b. document.getElementByName("p").innerHTML = "Hello World!";
c. document.getElement("p").innerHTML = "Hello World!";
d. document.getElementById("demo").value = "Hello World!";
e. document.getElementById("demo").innerHTML = "Hello World!";

6) To get information from a form submitted using the "get" method, we have to call which a function or access which variable?

a. Request.Form;
b. $_GET[];
c. $_POST['get'];
d. document.getElementByGet();
e. $("GET");

7) What is the correct way to connect to a MySQL database?

a. mysqli_db(host,username,password,dbname);
b. mysqli_connect(host,username,password,dbname);
c. mysqli_open(host,username,password,dbname);
d. mysqli_init(host,username,password,dbname);
e. mysqli_start(host,username,password,dbname);

8) What is not web server software?

a. XAMPP
b. Apache HTTP server
c. Microsoft IIS (Internet Information Services, formerly Internet Information Server)
d. Nginx
e. All are web server software

9) What is not a middleware application programming interface (API) for accessing database management systems?

a. ODBC
b. JDBC
c. ADO.net
d. OLEDB
e. MongoDB

10) Given the following XML which defines an "employees" object with 3 "employee" records, change it to the JSON-syntax text which defines an "employees" object with an array of 3 "employee" records. Which of the following is correct?

```
<employees>
  <employee>
    <firstName>John</firstName> <lastName>Doe</lastName>
  </employee>
  <employee>
    <firstName>Anna</firstName> <lastName>Smith</lastName>
  </employee>
  <employee>
    <firstName>Peter</firstName> <lastName>Jones</lastName>
  </employee>
</employees>
```

a.
```
{"employees":[
{"firstName":"John", "lastName":"Doe"},

{"firstName":"Anna", "lastName":"Smith"},

{"firstName":"Peter", "lastName":"Jones"}
]}
```

b.
```
{"employees":{
{"firstName":"John", "lastName":"Doe"},

{"firstName":"Anna", "lastName":"Smith"},

{"firstName":"Peter", "lastName":"Jones"}
}}
```

c.
```
{["employees"]:{"firstName":"John", "lastName":"Doe"},{"firstName":"Anna",
"lastName":"Smith"},{"firstName":"Peter", "lastName":"Jones"}}
}
```

d.
```
{"employees":{"firstName":"John", "lastName":"Doe"},{"firstName":"Anna",
"lastName":"Smith"},{"firstName":"Peter", "lastName":"Jones"}}
}
```

e.
```
["employees":{"firstName":"John",lastName":"Doe"},
 "employees":{"firstName":"Anna", "lastName":"Smith"},
 "employees":{"firstName":"Peter", "lastName":"Jones"}
]
```

8. Assume, we have a MySQL database server. The IP of the database server is configured to 10.16.86.112 at port 3306. The username and password are "student" and "cpe332", respectively. Write PHP code to query names of all students (the attributes "firstname" and "lastname" in the table "tblExam") from the database "CPE" (i.e., database name) and print first name and last name of each student in a table as shown below. [15 points]

First name	Last name
Pim	Onanong
Prite	Rungroj
Max	Potter
Nate	Fame
Ron	Bush

NOTE THAT you may use other connection standard (API) if you prefer.

```
<?php
// Define your variables
$servername = _____

_____

_____

_____

_____


// Create connection

$conn = _____

// Check connection
if (!$conn) {
    die("Connection failed: " . mysqli_connect_error());
}

$sql = _____

$result = _____

_____

_____

  // output data of each row
while($row =                    ) {
_____

_____
```

}

?>

Part IV: ERP and Big Data [13 points]

9. Answer the following questions. You will get 1 point for each correct answer (choosing all correct choices will get a point.) and 0 if you do not answer. The total points will be deducted by 1 point (i.e., -1) if your answer is wrong. [5 points]

   1) Which of the following statement is not correct?

      a. ERP is a suite of integrated applications that an organization can use to collect, store, manage and interpret data from many business activities.
      b. ERP provides an integrated view of core business processes, often in real-time, using common databases maintained by a database management system.
      c. ERP is an industry acronym for Enterprise Resource Planning.
      d. Analysis on ERP will enable you to produce financial and boardroom quality reports, as well as to conduct analysis on the performance of your organization.
      e. ERP is a subset of MRP (Material Requirements Planning).

   2) Which modules below are in ERP?
      a. Customer Relationship Management
      b. Supplier Relationship Management
      c. Human Resource
      d. Enterprise Asset Management
      e. Business Intelligence

3) If you are a senior manager or managing director, which information system is most suitable for you to access?
   a. Transaction Processing System
   b. Management Information System
   c. Executive Information System
   d. Payroll System
   e. Quality Management System
4) What are advantages of buying ERP packages?
   a. Low risk
   b. High credibility
   c. Standard industry practices
   d. Having source code
   e. Finding expert team easier than ones made by yourself

5) What are criteria for choosing an ERP system?
   a. Functional requirements
   b. Budget
   c. Implementation time
   d. Operating System
   e. Maintenance plan

10. Match each statement below with its most correct answer given in the table. You will get 0.5 points for each correct answer and 0 if you do not answer. The total points will be deducted by 0.5 points if your answer is wrong. [3 points]

Hadoop	MapReduce	BigTable	NoSQL	SQL	MongoDB	ACID	Graph Store
Key-Value Store	BSON	JSON	Hbase	Document Store	RDMBS	CAP	GFS
Nodes	Yahoo	Web-scale	Stability	Edges	Facebook	Scalability	Complexity
Atomicity	Cassandra	SAP	Microsoft	Social media	Google	Consistency	Availability

_____ 1) Everything in a transaction succeeds. Otherwise, it is rolled back.

_____ 2) Distributed storage system for managing structured data. It is column-oriented and used by Yahoo

_____ 3) It can classified as Document-based, key-value pairs, graph, or column-oriented stores.

_____ 4) The value is hidden and the key must be known to retrieve the value.

_____ 5) SQL supports ACID but NoSQL supports what?

_____ 6) Good external resources/data can be used for Customer Relationship Management.

11. What are SAP and AXAPTA (Microsoft Dynamics AX)? How are they similar and different? [5 points]

Part V: NoSQL [15 points]

12. Consider the same table in Question 2. Assume that we are using MongoDB. Answer the below questions. [15 points]

    1) Write a statement to insert the book titled "Introduction to Big Data" published by Weeleys into a collection name "library". [5 points]

BookID	Title	Publisher	Edition	NumPages	Year	Author
1	Advanced Computer Architecture	Pearsoon	1	123	2013	J.K. Rooling
2	Introduction to Big Data	Weeleys	3	200	2015	Matthew Deans
2	Introduction to Big Data	Weeleys	3	200	2015	Sally Reimer
4	Parallel and Cloud Computing	IEEEE	1	500	2013	Ekram Hossain
1	Advanced Computer Architecture	Pearsoon	1	123	2014	J.K. Rooling
5	Advanced Computer Architecture	Pearsoon	2	145	2014	J.K. Rooling
6	UX and UI: How to be a good designer	ApplePublisher	2	500	2014	J.K. Rooling
7	Parallel and Cloud Computing	Pearsoon	1	508	2013	P. Phond

2) Select all documents published **after** year 2013 and published by Pearsoon. [2 points]

3) Change the title of the book with BookID "2" from "Introduction to Big Data" to "Introduction to Big Data Analysis". [2 points]

4) Delete all books which have the author as "J.K. Rooling". [2 points]

5) If we have a document of each publisher as the example below

```
{
  _id:"123456789"
  name: "Weeleys ",
  founded: 1900,
  location: "Bangkok"
}
```

and we have a document of each author as the example below

```
{
  _id:"234567890"
  name: "J.K. Rooling",
  year: 2001,
  city: "Bangkok",
  languages:["Thai","English","Chinese"]
}
```

please use the concept of one-to-many relationships with document references to map book and publisher relationships and to map book and author relatioships.
Rewrite a document of the book titled "Introduction to Big Data" (BookID "2") with document references. The documents of the publisher and one of the authors are given above. You do not need to write them; however, you have to write a document of the co-author of the book. [4 points]