

UNIVERSITY OF BOLTON
CREATIVE TECHNOLOGIES GROUP
COMPUTING TECHNOLOGY
SEMESTER ONE EXAMINATIONS 2014/2015
DATABASE THEORY & PRACTICE
MODULE NO: CPU5002

Date: Monday 19th January 2015

Time: 10:00 – 12:00

INSTRUCTIONS TO CANDIDATES:

There are **SIX** questions on this paper.

Answer **ANY TWO** questions from Section A AND **ANY TWO** questions from Section B

All questions carry equal marks.

Section A – Database Issues - Answer TWO questions from this section.

Question A1 - General database theory

a. Consider this table definition:

Employee (EmployeeID, FirstName, LastName, Address, DepartmentID)

- i) In this case, the EmployeeID column is set to be the *primary key* of the table. Explain what this means, in terms of what the primary key is used for, and the constraints associated with it. **(4 marks)**
- ii) The DepartmentID column is set to be a *foreign key*. Explain what this means, in terms of what this tells us about the values in this column. **(3 marks)**
- iii) Write the SQL query that would produce a *view* of this table called 'EmployeeInfo', showing only the data from the EmployeeID, FirstName, LastName and Address columns. **(3 marks)**
- iv) With reference to your previous answer, explain what a view is, and why it might be used. **(3 marks)**
- v) Write an SQL query to return all the EmployeeIDs, their Names and Addresses from the Employee table. **(2 marks)**

b. Give a brief definition of the following terms:

- i) Database
ii) A relation in a database
iii) A tuple in a relation
iv) An attribute of a relation
v) The domain of an attribute
vi) The degree of a relation
vii) The cardinality of a relation

(7 marks)

Question A1 continues over the page...

Question A1 continued....

- c. What are the three levels represented by the ANSI-SPARC Three-Level Architecture model which provides a basis for understanding how a database management system works.

(3 marks)

Question A2 – Structured Query Language (SQL)

Consider these two tables, representing a database of products and orders for a company:

Products (ProductID, ProductName, Category, Price)

ProductID	ProductName	Category	Price
0001	Lipton	Beverages	199.99
0002	Haleeb	Dairy Products	28.97
0003	Shezan Ketchup	Condiments	9.99
0004	PowerBull	Beverages	49.99

Orders (OrderID, CustomerID, ProductID, Amount, Status)

OrderID	CustomerID	ProductID	Amount	Status
MKU8741M	C00957KM	0003	30	processing
MKU9368P	C00041PT	0001	15	dispatched
MKU6122F	C00642WS	0002	20	processing
MKU4851P	C00582LR	0001	10	cancelled

- a. Write an SQL query to create the 'Products' table. The ProductID is the Primary Key attribute and the 'Name' field should not be allowed to contain null values.

(3 marks)

- b. Write an SQL query to remove the 'PowerBull' product from the products table.

(2 marks)

- c. Write an SQL query to change the price for the product 'Haleeb' from '28.97' to '33.99'.

(2 marks)

Question A2 continues over the page...

Question A2 continued....

- d. Write an SQL query to return the ProductID, ProductName and the price column as OriginalPrice and another column to show the price as DiscountPrice (i.e. the discount is 50%). Use an alias of OriginalPrice and DiscountPrice for your columns.
(5 marks)
- e. Write an SQL command to add a new column (Description) to the Products table, representing a short description for each product. This should be a string value.
(3 marks)
- f. Write an SQL command to set all the values for this new column (Description) to null.
(2 marks)
- g. Write an SQL query to return all the ProductIDs, Names and Prices from the Products table, with the results presented in price order.
(3 marks)
- h. Write a query to add the following rows into the 'Products' table:
- | | | | |
|-----|-----------|------------|-------|
| 005 | Rich brew | Beverages | 90.00 |
| 006 | Megan | Condiments | 27.50 |
- (2 marks)**
- i. Write a query to return the ProductID, ProductName, OrderID and CustomerID from the Products and Orders tables using an Inner join.
(3 marks)

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Question A3 – Database design

- a. Explain why the Entity Relationship Modelling is useful in the database design process.

(2 marks)

- b. The following entities and attributes are identified by the database designer for a University database:

- Students (StudentID, FirstName, LastName, Age, CourseID, Mode)
- Courses (ID, Title, UCAScode, Award, AcademicGroup, CourseLeader)
- AcademicGroups (Code, Name, Location)
- StaffMember (Name, AcademicGroup, Office)

Draw an Entity-Relationship model (using the UML notation) that represents these 4 entities, assuming the following relationships:

- i. A student takes 1 or more courses
- ii. An academic group runs 1 or more courses
- iii. An academic group employs 1 or 6 staff members
- iv. A staff member teaches between 2 and 4 courses
- v. A staff member supervises between 1 and 6 students

(6 marks)

- c. Relations that have redundant data may have problems known as anomalies. Name three types of anomalies.

(3 marks)

- d. Consider this table:

Tutor (TutorID, TutorName, DepartmentName, Location)

TutorID	TutorName	DepartmentName	Location
1	Alan Anderson	Computing	C-Block
2	Brenda Brown	Psychology	T2
3	Colin Clarke	Education	T4
4	Dan Davidson	Sports	Bolton One
5	Eric Evans	Computing	C-Block

Question A3 continued over the page...

Question A3 continued....

- i) The Tutor table is currently normalised to 2nd Normal Form. Explain how this is determined by describing the rules for each of the first 3 Normal Forms. **(5 marks)**
- ii) Define relations that would represent the above table in 3rd Normal Form. You can use the below format to describe your relations.
Tutor (TutorID, TutorName, DepartmentName, Location) **(3 marks)**
- iii) Describe two types of referential action that can be taken in order to enforce referential integrity. **(4 marks)**
- iv) Define functional dependency. **(2 marks)**

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Section B – Data formats and web interfaces to databases

Answer **TWO** questions from this section.

Question B1 – The Extensible Markup Language (XML)

- a. Describe the advantages of using XML. **(4 marks)**
- b. Describe two methods for validating XML files. **(8 marks)**
- c. Explain the difference between an XML element and attribute. **(3 marks)**
- d. Write an XML file suitable for holding details of different products. Use it to hold the following information for each product: productID, productName, category and price. Show the XML file populated with data relating to any 2 products including an attribute for each product element to provide additional information. **(10 marks)**

Question B2 – Web access to databases

- a. Explain the difference between MySQL and MySQLi extension **(2 marks)**
- b. Describe the SQL injection attack and name two methods a web developer can use to reduce the risk of an SQL injection attack. **(4 marks)**
- c. Explain the purpose of the action and method (i.e. post) attributes of the HTML form. **(4 marks)**
- d. Write a PHP script, to show how the information submitted to a web form can be saved to a MySQL database table named 'Students' which has 4 fields named: stNumber, firstName, lastName, and email. The HTML form has 4 fields (StNumber, FirstName, LastName, and Email) which correspond to the 4 database fields. State the necessary steps to establish a connection to the database server and the database. Finally, display all data from the students table after the insertion of the student record is successful. **(15 marks)**

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Question B3 – Transferring the contents of a database table to an XML file

The table below shows a MySQL table named employees. Write a PHP script to extract the information from the table and create an XML equivalent which is saved in a file named employeeDetails.xml.

EmpID	Title	FirstName	LastName
01	Engineer	David	Brown
02	Manager	John	Smith
03	Engineer	Amanda	Morris

(25 marks)

END OF QUESTIONS