

**UNIVERSITY OF BOLTON**  
**CREATIVE TECHNOLOGIES**  
**COMPUTING TECHNOLOGY**  
**SEMESTER ONE EXAMINATIONS 2015/2016**  
**DATABASE THEORY & PRACTICE**  
**MODULE NO: CPU5002**

Date: Monday 11<sup>th</sup> January 2016

Time: 10:00 – 12:00

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**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.

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

**Question A1 - General database theory**

a. Discuss briefly the following:

- i) Database and its purpose
- ii) Database Management System and its advantages

**(6 marks)**

b. Consider these two tables:

**Staff** (StaffID, FirstName, LastName, DeptID)

StaffID	FirstName	LastName	DeptID
11000	Peter	John	EDU
11001	Barrie	Fisher	BAM
11002	Mohammad	Zakir	COM
11003	Julie	Banks	PSY

**Department** (DeptID, Name, Location)

DeptID	Name	Location
BAM	Business Management	M-Block
COM	Computing	C-Block
EDU	Education	M-Block
PSY	Psychology	T2

i) How many attributes and tuples are shown in the Staff relation?

**(2 marks)**

ii) What is the degree and cardinality of the Department relation?

**(2 marks)**

iii) The StaffID column is set to be the primary key of the Staff table. Explain what this means, in terms of what the primary key is used for, the constraints associated with it, and why StaffID has been chosen as the primary key instead of any of the other column.

**(4 marks)**

**Question A1 continued over the page...**

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**Question A1 continued...**

ii) The DeptID column of the Staff table 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)**

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)**

d. For each of the following statements specify if they are true or false:

- i) A null value indicates an erroneous value.
- ii) A primary key must be a numeric value.
- iii) A primary key can be set to a null value.
- iv) Two tuples can have the same primary key value.
- v) A foreign key can be set to a null value.

**(5 marks)**

**Question A2 – Structured Query Language (SQL)**

Consider these two tables, representing criminal investigation cases, police officers and suspects:

**Cases** (CaseNumber, Charge, OfficerInChargeID, Suspect)

CaseNumber	Charge	OfficerInChargeID	Suspect
1	Drug possession	B001	Avon Barksdale
2	Murder	B002	Omar Little
3	Money laundering	B003	Russell Bell
4	Murder	B004	Roland Brice

**Officers** (OfficerInChargeID, Name, Rank, Unit)

OfficerInChargeID	Name	Rank	Unit
B003	Cedric Daniels	Lieutenant	Major crimes
B002	Lester Freamon	Detective	Homicide
B005	Thomas Hauk	Sergeant	Narcotics
B004	Kima Greggs	Detective	Homicide
B001	Jimmy McNulty	Detective	Major crimes

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**Question A2 continued...**

- a. Write an SQL query to return the names and ranks of all the police officers from the Officers table. **(1 marks)**
- b. Write an SQL query to create the 'Cases' table. The CaseNumber is the Primary Key attribute and the 'Suspect' field should not be allowed to contain null values. **(3 marks)**
- c. Write a query using a join that returns the case numbers of all cases, along with the name and unit of the officer in charge. **(3 marks)**
- d. Write an SQL command to add a new column (SuspectAge) to the Cases table. This should be an integer value. **(2 marks)**
- e. Write an SQL command to set all the values for this new column (SuspectAge) to null. **(2 marks)**
- f. Write a query to return the case number, charge, and suspect's name and address for all murder charges. **(3 marks)**
- g. Write an SQL query to remove the suspect 'Omar Little' from the Cases table. **(2 marks)**
- h. Write an SQL query to change the charge for the suspect 'Russell Bell' from 'Money laundering' to 'Murder'. **(2 marks)**
- i. Write a query using a join that returns the name and unit of all police officers, including the number of any open cases they are currently in charge of. **(3 marks)**
- j. Write an SQL query to return all the data from the Officers table, with the results presented in OfficerInChargeID order. **(2 marks)**

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**Question A2 continued...**

k. Write a query to add the following rows into the 'Officers' table:

B007	Richie Brew	Sergeant	Homicide
B006	Megan Hauk	Detective	Narcotics

**(2 marks)****Question A3 – Database design**

a. Consider this table:

Actor	DOB	Film	Year	Fee	Studio	studio_city
Tom Cruise	03/07/1962	Mission: Impossible II	2000	14	MGM	Hollywood
		War of the Worlds	2005	20	MGM	Hollywood
Thandie Newton	06/11/1972	Mission: Impossible II	2000	6	MGM	Hollywood
Brad Pitt	18/12/1963	Ocean's Eleven	2001	10	Paramount	Miami
		Moneyball	2011	11	Time Warner	New York
Jim Carrey	17/01/1962	Yes Man	2008	15	Time Warner	New York

Fee = the fee charge by an actor (in millions \$)

Define relations that would represent the above table in 3<sup>rd</sup> Normal Form. Explain how this is determined by describing the rules for each of the 3 Normal Forms.

**(10 marks)**

b. Consider this table:

Student ID	Student Name	Student Address	Course ID	Course Name
S01	Jones Smith	Bolton	50	Computing
S02	Richard Thomas	Liverpool	55	Accounts
S10	Amanda Gill	Glasgow	40	Maths

The table shown is susceptible to different database anomalies. Provide examples of insertion, deletion, and modification anomalies.

**(7 marks)**

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**Question A3 continued...**

c. 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

**(8 marks)**

**Section B – Data formats, security and web interfaces to databases**

**Answer TWO questions from this section.**

**Question B1 – The Extensible Markup Language (XML)**

a. Write an XML file suitable for holding details of students in a class. Use it to hold the following information for each student: studentName, idNumber, tutor, and email address. Show the XML file populated with data relating to 3 students.

**(8 marks)**

b. Without writing any code, describe 2 methods for validating XML files.

**(10 marks)**

c. Describe the advantages of using XML.

**(4 marks)**

d. Explain the difference between XML and HTML.

**(3 marks)**

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**Question B2 – Web access to databases**

- a. Write a PHP script, to show how the information submitted to a web form can be saved to a MySQL database table named 'Employee' which has 4 fields named: empID, Name, DoB, and Department. The HTML form has 4 fields (Id, name, dob, and department) 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 Employee table after the insertion of the employee record is successful.. **(15 marks)**
- b. Explain the purpose of the HTML form's 'method' attribute when it's value is set to 'post'. **(4 marks)**
- c. Explain the difference between the MySQL and MySQLi PHP extensions. **(2 marks)**
- d. Explain what a view is, and why it might be used. **(4 marks)**

**Question B3 – Database security**

- a. Discuss briefly the following:  
i) Database security  
ii) The three main aspects of database security. **(8 marks)**
- b. Discuss 5 methods used to implement database security. **(10 marks)**
- c. Describe what is meant by an 'SQL injection attack' and briefly describe 5 design principles that can be followed to reduce the risk of such an attack.. **(7 marks)**

**END OF QUESTIONS**