

UNIVERSITY OF BOLTON
CREATIVE TECHNOLOGIES GROUP
COMPUTING TECHNOLOGY
SEMESTER ONE EXAMINATION 2018/2019
DATABASE THEORY & PRACTICE
MODULE NO: CPU5002

Date: Monday 14th January 2019

Time: 10:00 – 12:00

INSTRUCTIONS TO CANDIDATES:

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

Section A - Answer **ANY TWO** questions

Section B - Answer **ANY TWO** questions

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 the disadvantages and advantages of using a Database Management System to manage corporate data.

(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 Department relation?

(2 marks)

- ii) What is the degree and cardinality of the Staff 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)

- iv) 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)

Question A1 continues over the page....

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Question A1 continued....

- c. With regard to the tables above give an example of referential integrity. **(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 text value.
 - iii) A primary key must be an incremented value
 - iv) Two tuples can have the same primary key value.
 - v) A foreign key can be must not be set to a null value.
- (5 marks)**

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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

- Write an SQL query to return the names and units of all the police officers from the Officers table.
(1 marks)
- 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)
- 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)
- Write an SQL command to add a new column (SuspectAge) to the Cases table. This should be an integer value.
(2 marks)

Question A2 continues over the page....

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Question A2 continued....

- 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 major crimes charges.
(3 marks)
- g. Write an SQL query to remove the suspect 'Kima Greggs' from the Cases table.
(2 marks)
- h. Write an SQL query to change the charge for the suspect 'Russell Bell' from 'Money laundering' to 'Assault'.
(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 Rank order.
(2 marks)
- 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)

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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 3rd 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)

Question A3 continues over the page....

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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 3 or more courses
- ii. An academic group runs 2 or more courses
- iii. An academic group employs 1 or more staff members
- iv. A staff member teaches between 0 and 9 courses
- v. A staff member supervises between 0 and 8 students

(8 marks)

END OF SECTION A

Section B – Terminology, Security and Database Models
Answer **TWO** questions from this section.

Question B1 – Database Models

- a. Draw a correctly labelled diagram that represents the ANSI-SPARC 3 layer model **(13 marks)**
- b. Explain the term ACID when related to database transactions. **(8 marks)**
- c. What are the four transaction types that databases need to support Relational Database Operations **(4 marks)**

Section B continues over the page....

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Question B2 – Terminology

- a. Identify three main characteristics of relational database **(3 marks)**
- b. Define and give an example of the following terms
- i. Tuple
 - ii. Relation
 - iii. Attribute
 - iv. Cardinality
 - v. Degree
 - vi. Domain
- (12 marks)**
- c. Identify 3 non-numeric SQL datatypes and give an appropriate example of usage **(6 marks)**
- d. Why is the view object considered the best way for users to access data? **(4 marks)**

Question B3 – Database security

- a. Describe 5 potential scenarios that could result in the compromise of database security and identify the consequences of the compromise. **(15 marks)**
- b. Discuss 5 methods used to implement database security. **(10 marks)**

END OF QUESTIONS