# UNIVERSITY OF BOLTON

# WESTERN INTERNATIONAL COLLEGE FZE

# BSC (HONS) COMPUTING

# SEMESTER ONE EXAMINATION 2019/2020

# DATABASE THEORY AND PRACTICE

# MODULE NO: CPU5002



**Date: Tuesday 14th January 2020** **Time: 1.00 PM – 3.00 PM**

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**INSTRUCTIONS TO CANDIDATES:**

**There are TWO sections 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.**

**Q1.**

a. Each member of staff in a company works on a single project. Several staff can work on for a project, and all staff working on the same project shares the same office. The following table stores information about staff, projects and offices.

*Works (StaffNbr, ProjectNbr, ProjectDescription, OfficeNumber)*

(i) Explain how an insert or update anomaly could arise in the *Works* table. (3 marks)

(ii) Suggest a solution so that the table can be transformed to remove this flaw. (2 marks)

b. The following table 1 keeps records of medical consultations conducted in a medical practice. Each consultation takes place in a room and is conducted by a doctor on a patient. A patient cannot have two consultations on the same day.

*Table.1 Medical Consultation*

| patientID | consultationDate | consultationTime | doctorID | roomNo |
|---|---|---|---|---|
| P01 | 13-Oct-19 | 8:30 | D01 | R11 |
| P01 | 18-Oct-19 | 15:00 | D02 | R02 |
| P02 | 17-Oct-19 | 10:00 | D01 | R11 |
| P03 | 13-Oct-19 | 10:00 | D02 | R02 |
| P04 | 26-Oct-19 | 8:30 | D01 | R11 |

(i) Explain what is meant by a “functional dependency” between attributes in a table. (2 marks)

(ii) Identify two functional dependencies for the Table 1. (3 marks)

c. Briefly explain why a table that is in 1st Normal Form and has no composite primary key is automatically in 2nd Normal Form. (2 Marks)

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**Q1 Continued over the page**

**Q1 Continued**

d. A company uses Table 2 to record sales details for each salesperson on a monthly basis to monitor the performance. Data provided is in Un-normalized form, to improve the efficiency normalize the data based on the Normalization rules. Identify all the functional dependencies and transform the tables into 3rd Normal Form. For each normal form, give the rules and expand your solution. Ensure the primary key is clearly indicated in each potentially new table.

*Table 2. Sales Report*

**KL Sales FZE, Dubai**
**Sales Report**

Salesperson ID: 3333
Salesperson Name: John
Sales Area: Dubai North
Sales Month: October

| CustomerID | CustomerName | WarehouseID | WarehouseLocation | SalesAmount | SalesCommission |
|---|---|---|---|---|---|
| C1 | Al Dahid LLC | W101 | Jebel Ali | 10000 AED | 250 AED |
| C2 | Levey & Sons | W102 | Deira | 20000 AED | 500 AED |
| C3 | KLTP LLC | W103 | Karama | 15000 AED | 350 AED |
| C4 | Thomson Services | W104 | Ras Al Khor | 8000 AED | 100 AED |
| C5 | Delta Services | W105 | Jebel Ali | 17000 AED | 430 AED |

(13 marks)

**Total 25 marks**

**Q2.**

a. Relational databases are very effective in situations for which they are appropriate. In other situations, simpler file-based solutions may be sufficient. Suppose you are required to implement a system for storing information about a library management system. Give TWO reasons why a database system is superior to a file-based system for this task. Illustrate the answer with suitable examples.

(4 marks)

b. Discuss about Object relational data model and give an example DBMS for the data model.

(2 marks)

c. Compare and contrast Composite and Multi-valued attributes in a relation.

(3 marks)

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**Q2 continued over the page**

**Q2 continued**

d. Discuss the reasons for the three-level architecture for a database management system. Support with required diagram and discuss the three levels with suitable description and examples.

(8 marks)

*Table 3. Client*

| **Client _ID** | **Client Name** | **Client Breed** | **Client Birth Date** | **Treatment_ ID** | **Owner _ID** |
|---|---|---|---|---|---|
| C1 | Tommy | German Shepherd | 24-Jun-15 | T1443 | O347 |
| C2 | Bruno | Rottweiler | 12-Jul-13 | T1114 | O102 |
| C3 | Nicky | Labrador | 25-Feb-19 | T2998 | O732 |
| C4 | Rex | Poodle | 01-Dec-18 | T1664 | O223 |
| C5 | Simba | Labrador | 19-Mar-19 | T1765 | O375 |

e. For each of the following terms, explain the term in database management system concept and give an example based on the Table3.Client.

i. Primary Key

(2 Marks)

ii. Cardinality

(2 Marks)

iii. Metadata

(2 Marks)

iv. Attribute

(2 Marks)

**Total 25 marks**

**Q3**.

Consider the following three tables Table 4, Table 5 and Table 6, representing TP_Car Insurance database. Write the SQL queries for the following questions.

a. Add a new field “EmiratesIdNumber” to the customer table.

(3 marks)

b. Search and display the policy details of a customer based on customer name as “Christa”

(2 marks)

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**Q3 Continued over the page**

**Q3 continued**

c. The policies which are going to expire on or before 27th February, 2020 need to be identified and customers need to be informed through registered mobile. So find the customer details and display the details in the order of early expiry date of the policy at the top.

(3 marks)

*Table 4: Customer (CustID, Name, Cust_Gender,Cust_Mobile)*

| CustID | Name | Cust_Gender | Cust_Mobile |
|---|---|---|---|
| C101 | Peter | M | 055555556 |
| C102 | John | M | 054444449 |
| C103 | Susan | F | 056766668 |
| C104 | Diana | F | 057777774 |
| C105 | Leo | M | 058888889 |
| C106 | Patrick | M | 055578786 |
| C107 | Christa | F | 056744487 |

*Table 5: Policy (Policy_number,Start_date,Expiry_date,Cust_Id,Policy_amount)*

| Policy_number | Start_date | Expiry_date | Cust_Id | Policy_amount |
|---|---|---|---|---|
| P551 | 12/07/2019 | 31/05/2020 | C101 | AED 22,000.00 |
| P552 | 18/05/2019 | 13/03/2020 | C102 | AED 12,000.00 |
| P553 | 13/01/2019 | 28/02/2020 | C103 | AED 8,000.00 |
| P554 | 22/05/2019 | 14/01/2020 | C101 | AED 10,000.00 |
| P557 | 16/04/2019 | 18/02/2020 | C105 | AED 25,000.00 |
| P661 | 26/02/2019 | 25/02/2020 | C107 | AED 50,000.00 |

*Table 6: Payments(Payment_ID, Policy_number, Payment_amount, Payment_Date, Receipt_number)*

| Payment_ID | Policy_number | Payment_amount | Payment_Date | Receipt_number |
|---|---|---|---|---|
| 111 | P551 | AED 2,000.00 | 12/07/2019 | R17 |
| 112 | P553 | AED 1,000.00 | 18/05/2019 | R12 |
| 113 | P557 | AED 8,00.00 | 13/01/2019 | R15 |
| 114 | P554 | AED 1,500.00 | 22/05/2019 | R23 |
| 115 | P661 | AED 2,000.00 | 01/12/2019 | R25 |

d. Find and display the number of male customers for the insurance company.

(2 marks)

e. Insert a Payment for the policy_number P552 in the Payment table on 25th February, 2020.

(2 marks)

**Q3 Continued over the page**

**Q3 Continued**

f. Update the expiry date of his policy as 19th March, 2021 for the customer named "Peter"

(3 marks)

g. Calculate and display the total payment done for each policy based on policy_number.

(3 marks)

h. Using your own specific examples, illustrate the following SQL querying techniques:

(i) Aggregate functions.

(2 marks)

(ii) Right outer join.

(2 marks)

(iii) Sub-Queries.

(3 marks)

**Total 25 Marks**

**END OF SECTION A**

**Please turn the page for SECTION B**

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**Section B: Data formats, Security and web interfaces to databases**

**Answer TWO questions from this section.**

**Q4.**

**a.** A company uses a number of items to produce goods. Each item has a unique ID, and has a description. Faults on items are identified by unique IDs, have descriptions, and are reported at a time represented by time_reported. Any number of technicians may be assigned to work on a fault until it is fixed. The time at which each fault is fixed is recorded as time_fixed. Each technician also records the time spent (hours) on each fault as time_spent. Any number of parts may be used to fix a fault. The qty_used of each part is noted against the corresponding fault. Each part is identified by an ID, has a given name and can have any number of Suppliers. Suppliers are identified by an ID, a name and an address. Each technician is identified by an ID, has a full_name and zero or more qualifications. Each qualification has a unique ID, name and awarding body. The date when a technician has gained any given qualification is also recorded.

Using a recognised modeling notation of your choice, draw an Entity-Relationship model for the given above, which shows the entity types, with corresponding attributes, primary keys and also the relationships between the entities. For each relationship, show their degree (One: One; One: Many or Many: Many) and participation (Mandatory or Optional). State any assumptions you make to fill any gaps in the scenario.

(15 Marks)

b. Design a set of tables derived from your Entity-Relationship model in Q3.a above. Clearly highlight all primary keys and foreign Show how the ER-diagram can be converted into relational tables based on their relationships.

(7 marks)

c. Distinguish between specialization and generalization. How will you represent generalization in an ER diagram?

(3 marks)

**Total 25 marks**

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**Please turn the page**

**Q5.**

a. Write the code to create a HTML form for a car registration page of RTA which has 4 fields (Car_Registration_Number, Brand_Name, Insurance_number, and Owner_Name) which need to map to 4 fields of the MySQL database table *Registered_Cars*.
Write a PHP script, to show how the information submitted to the web form can be saved to the table named *Registered_Cars* under *Cars* database which has 4 fields named: Car_Reg_Number, Brand, Insurance_ policy_number and Owner. The PHP script should include the necessary steps to establish a connection to the MySQL database and add a row inside the table using the provided Form data. It means data need to be entered into table using the form.

(10 marks)

b. Write the XML code suitable for holding details of different books. Use it to hold the following information for each book: ISBN_Number, AuthorName, BookTitle, subject and price. Show the XML file populated with data relating to any two books including attributes for elements (wherever possible) to provide additional information.

(8 marks)

c. Compare and contrast Get and Post methods in PHP.

(4 marks)

d. Differentiate XML and HTML.

(3 marks)

**Total 25 Marks**

**Q6.**

The directors of Blue-Cross are keen to push forward with a web-enabled system with a database at the backend to allow online Veterinary service for its clients but, they have need for some technical and expert IT advice. One of the main responsibilities of a DBA (database administrator) is to enforce security measures on user access to database data.

a. Describe ANY ONE security measures a DBA will implement and provide examples, written in SQL, of their construction, using your own examples.

(3 marks)

b. Discuss about SQL injection attack. Suggest a solution to control SQL injection attacks.

(3 marks)

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**Q6 continued over the page**

**Q6 continued**

c. To enforce security and achieve consistency, explain to the directors the importance of the following concepts, using your own examples.

   (i) Data integrity.

   (6 marks)

   (ii) Data security.

   (6 marks)

d. Explain Data hiding using Views in database with your own examples and also how views can be implemented into the new veterinary practice web-based IT system. Write the SQL query to create the View for veterinary system. Comment on the usefulness and features of such an approach.

   (5 Marks)

e. Identify a reason why an attribute would have an index associated with it in a relational table. Write the SQL syntax to create an index.

   (2 marks)

**Total 25 marks**

**END OF PAPER**