FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE & SOFTWARE ENGINEERING

MODULE   IFM2A10/IFM02A2
                         INFORMATICS 2A

CAMPUS   APK

FINAL SUMMATIVE   2020
ASSESSMENT Special
SSA

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INTERNAL MODERATOR   MR FF BLAUW

DURATION   120 minutes   MARKS   100

PLEASE TAKE CAREFUL NOTE OF THE FOLLOWING INSTRUCTIONS:

1. Answer **ALL** questions. You will have **one hour** after the assessment to upload your answers to **Eve (https://eve.uj.ac.za)**. Answers must be uploaded to the correct practical slot for IFM2A's **FSA Special SSA**. A backup submission should be submitted using the following form: https://forms.gle/G3ZhdVHVTXrLDYmR8

2. Tools required during this assessment:

    Writing answers: Microsoft Word (or equivalent)

    Drawing diagrams: Draw.io, Lucidchart (or equivalent)

3. The expected format of submission:

    Start each section on a new page.

    Clearly number the questions.

    Include diagrams directly in the document at the correct question.

    Once you are finished writing, please save the document as a **PDF** and upload a single document.

4. Writing without a Computer:

    While it is advised that you type the test, you may also write the test, by hand, on paper. If you do this, please number the physical pages before scanning/taking the photos. After that, you must use CamScanner or take CLEAR photographs and upload.

5. Answers must pertain to the material covered during the course of the module.

6. This question paper consists of 7 (including this cover page) pages.

7. This question paper consists of 5 question sections.

8. Don't panic; read your questions carefully, and good luck!

Question 1

FeastFam is a restaurant group which consists of multiple restaurants nationwide. Due to recent restrictions imposed by the government, the group has had to adapt to a new way of managing information in their daily operations. FeastFam has approached you to help them with the creation of a database which will keep track of the following information:

- FeastFam franchise group has a main headquarter office. The address of this office should be stored in the database.

- FeastFam has many restaurants across South Africa (indicated using a "has-a" relationship).

- Each restaurant has a name, location and phone number.

To handle reservations the following needs to be considered:

- Each restaurant can have many customers make reservations.

- Each customer can have many restaurants at which they make reservations.

- Each customer has a name, surname and contact number.

- For each reservation the following information is stored: Date, time, number of guests.

When the customer arrives with their guests, data such as their temperature must be captured in a ReservationLog.

- Every reservation, therefore, has multiple ReservationLogs.

- The data that must be stored for each guest on arrival includes: Name, surname, contact number and temperature.

The FeastFam database, furthermore, needs to keep track of two types of staff members, namely, administrators and waiters. Staff members must be either an administrator or a waiter but not both.

- Each staff member has a unique staff ID, name and surname.

- Each administrator has the name of their highest qualification stored in the database.

- Each waiter has a date when they started serving.

- Each waiter is also assigned many reservations and each reservation is handled by a single waiter.

1.1) Draw an Extended Entity Relationship Diagram (EERD) using the information [25] provided above. Include all attributes and their datatypes.

Question 2

2.1) Provide an **example of a business rule** that reveals a relationship from the above scenario in **Question 1**. **Identify** which type of **relationship** this is. (2)

2.2) Select one of the entities from your EERD from **Question 1**. State what the **degree** would be of this entity's implemented table **and give a reason** for your answer. (2)

2.3) Write out the **relational schema** of one of your EERD relations from **Question 1** which has at least one **foreign key**. (3)

2.4) Read the following scenario: (4)

> *A studio that provides dance classes to students needs your help to store their data in a database. **Each student can enrol in multiple dance classes and each dance class can have multiple students enrolled.***

What **kind of relationship** is described by the underlined sentence? **Explain** how this scenario is implemented in a Database Management System. Refer to the handling of **keys** in this scenario.

2.5) Discuss which **properties of a relation** are violated by the following table. In your answer, state any **two** properties **and explain** how each property is being violated: (4)

Event	Participants & Score
Festival Dance Competition	Nick Dube 5 Allie Smith 10
Youth Grand Prix Dance	Thabo Buchan 9 Nelo Camillo 7
Festival Dance Competition	Kelly Minnick 8

[15]

Question 3

Invoice-No	Invoice-Date	Product-No	Product-Name	Product-Price	Quantity
12345	22/04/2017	1023	Soft Chair	R2000	3
		1022	Hard Chair	R1000	12
		1087	Desk	R5000	3
12346	20/04/2017	1023	Soft Chair	R2000	5
12348	19/04/2017	1987	Large Chest	R3000	4
23144	19/04/2017	6548	Coffee Table	R500	3
12387	10/04/2017	6547	Tea Table	R200	2

3.1 In which normal form is the above table? Motivate your answer. (2)

3.2 What would be a preferable primary key base on the given table? (2)

3.3 Provide all the dependencies of the given table. (6)

3.4 Convert the table into the second normal form. (9)

3.5 Convert the table into the third normal form. (3)

3.6 Provide three(3) suggestions on how to improve the design of the table after they have been restructured into third normal form. (3)

[25]

Question 4

Moto-Works is a car part store that has been operating in Soweto for the past thirty years. The company sells various kinds of car parts at their store, ranging from car electronic systems such as multimedia and charging parts, to breaking systems such as brake discs and brake pads. Moto-Works would like to develop an information system to aid in their sales operations and have thus hired you to design the database for this.

Moto-Works currently keeps a wide variety of car parts at their store. The usual information stored for each car part includes the name, manufacturer, model type, price and quantity on hand. They would like all of this informaiton to be maintained by the new information system. Alongside this, Moto-Works would like you to keep track of the various car part catagories (such as electronic system and breaking system).

Apart from keeping track of these car parts, Moto-Works would like the new information system to also keep track of the purchases made by their clients. Purchases made by clients are shown in invoices which list all the car parts bought by the client, and the quantities of each car part. The price at which a car part was bought should also be recorded at the time of purchase of the car parts.

Moto-Works has multiple return clients to whome the company would like to send communication on sales and specials at the store. Therefore the company would like the new information system to keep track of customers and their contact details

Moto-Works has sales agents who are evaluated by the number of invoices they process per month. Therefore Moto-Works would like the new information system to provide a way for keeping track of which sales agent was responsible for generating an invoice for each client's purchase.

Given the information above, draw an ER Diagram showing the following:

- Entities,
- Attributes,
- All key attributes,
- Data types for each attribute, and
- All relationships between the entities.

NB: You may use one of the standardised ERD notations. **[15]**

Question 5

Create the following SQL queries using the ER model given below.

5.1 List the number of students registered for each Degree.   [5]

5.2 List all the Degrees that are link to a student.   [4]

5.3 List all the students that have registered for IFM2A and CSC2A.   [5]

5.4 List all the degrees that have no students.   [6]

                    [20]

Degree
De_Degree_Code: VARCHAR(10) - {PK}
De_Name: VARCHAR(100)
De_Type: VARCHAR(50)
De_APS: INTEGER

1..1

0..*

Student
S_Student_No: CHAR(9) - {PK}
S_Name: VARCHAR(100)
S_Surname: VARCHAR(100)
S_DOB DATE
De_Degree_Code: VARCHAR(10) - {FK}

1..1

1..*

Bridge_Student_Module
S_Student_No: CHAR(9) - {PK}{FK}
M_Module_Code: CHAR(7) - {PK}{FK}
Bri_Semester_mark: INTEGER
Bri_Exam_mark: INTEGER

1..*

1..1

Module
M_Module_Code: CHAR(7) - {PK}
M_Name: VARCHAR(???)
Credit: INTEGER
Level: INTEGER
E_Staff_No: CHAR(12) - {FK}

1..*   1..1

Campus
C_CampusID: VARCHAR(10) - {PK}
C_Name: VARCHAR(100)
C_Address: VARCHAR(255)

1..1

1..*

Department
D_DepartmentID: VARCHAR(10) - {PK}
D_Name: VARCHAR(100)
D_Location: VARCHAR(255)
C_CampusID: VARCHAR(10) - {FK}

1..1

1..*

Employee
E_Staff_No: CHAR(12) - {PK}
E_Names: VARCHAR(100)
E_Surname: VARCHAR(100)
E_Contact: VARCHAR(100)
E_Type: VARCHAR(50)
D_DepartmentID: VARCHAR(10) - {FK}