FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING	
MODULE	**IFM2A10/IFM02A2** Database Design
CAMPUS	APK
EXAM	JUNE 2016

ASSESSOR: MR SMA MAVEE

                                                                                              MR TD MPHUTHI

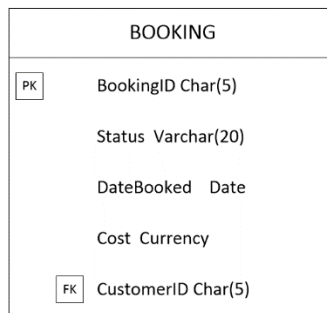**INTERNAL MODERATOR:**   MR FF BLAUW

DURATION: 120 MINUTES   **MARKS:** 100

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NUMBER OF PAGES: 5

PLEASE TAKE CAREFUL NOTE OF THE FOLLOWING:

1. Answer **ALL** questions **ONLY** in the supplied **ANSWER SHEET**.

2. **Do NOT write/draw in pencil**. **Anything in pencil <u>WILL NOT BE MARKED</u>**.

3. Write **neatly** and **legibly**.

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

5. **NO** calculators may be used.

6. Make sure to read and follow all instructions written in the exam answer sheet.

QUESTION 1

1.1 Data Quality can be examined at a number of different levels including completeness and timeliness. Briefly explain how completeness and timeliness can affect the quality of data. **(2)**

1.2 A Database Management System (DBMS) is a collection of programs that manage database structure and controls access to data. By means of a diagram, illustrate how a DBMS manages the interaction between the end user and the database. **(6)**

[8]

QUESTION 2

2.1 Provide a relational schema for the entity below: **(4)**

BOOKING	
PK	BookingID Char(5)
	Status Varchar(20)
	DateBooked Date
	Cost Currency
FK	CustomerID Char(5)

2.2 In 1985, Dr E.F. Codd published a list of 12 rules to define a relational database system. The reason for these rules was the concern that many vendors were marketing products as "relational" even though those products did not meet minimum relational standards. Name and briefly describe two of Codd's twelve relational database rules. **(4)**

[8]

QUESTION 3

3.1 Name and briefly discuss the properties of transactions. **(10)**

**3.2** Provide examples on how Software and Hardware can cause database failures. **(2)**

[12]

QUESTION 4

4.1 Distributed Database Management Systems (DDBMSs) govern storage and processing of logically related data over interconnected computer systems in which both data and processing functions are distributed among several sites. DDBMSs bring advantages such as faster data access in demand sites, improved communications and less danger of single-point failure. Although it brings many benefits, briefly discuss the disadvantages of using DDBMS environments. **(3)**

4.2 Briefly discuss Cloud Computing. Define it, and describe three main benefits of using a cloud infrastructure. **(5)**

[8]

QUESTION 5

5.1 Threats are any set of circumstances that have the potential to cause loss, misuse or harm to the system and/or its data.

    A. List three possible results of threats that are materialized on a system or database. **(3)**

    B. Briefly discuss two possible data security measures that can be used to reduce the possibility of security breaches to a system or database. **(2)**

5.2 The System Development Life Cycle (SDLC) and the Database Life Cycle (DBLC) work together in the construction of a full implemented system. The diagram bellow shows the phases of the SDLC. **(10)**
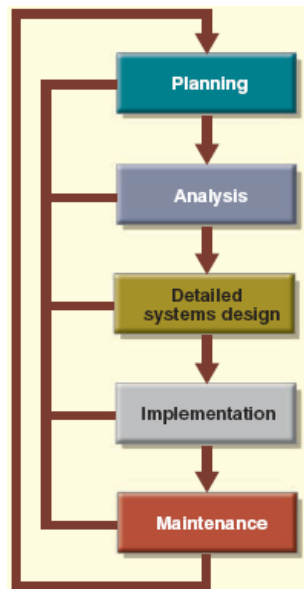
Within each of the phases of the SDLC, briefly discuss how the database development is carried out.

[15]

QUESTION 6

NetBooks is a recently established book store in Southern Africa. They are spread over a series of branches across the region, and currently use a spreadsheet to keep track of their stock across each of their stores. The table below shows a sample of their current spreadsheet data.

Book_ID	Book_Title	Book_Price	Author_ID	Author_Name	Pages	Branch	Copies
2	The Lord of the Rings	1299.95	5	J. R. R. Tolkien	654	CPT	3
2	The Lord of the Rings	1299.95	5	J. R. R. Tolkien	654	JHB	7
7	HP & the Cursed Child	349.95	4	J.K. Rowling	320	CPT	4
7	HP & the Cursed Child	349.95	4	J.K. Rowling	320	MPT	4
45	The Last Lecture	299.95	10	Randy Pausch	145	CPT	23
45	The Last Lecture	299.95	10	Randy Pausch	145	JHB	14
45	The Last Lecture	299.95	10	Randy Pausch	145	MPT	3
100	Strengths Finder 2.0	249.95	12	Tom Rath	175	JHB	75

6.1 Use dependency diagrams to depict how the spreadsheet above should be structured in Third Normal Form (3NF) when implementing it on a relational database. Show only 3NF **(8)**

[8]

QUESTION 7

7.1 Why do organizations use business intelligence? **(5)**

7.2 Discuss Data Warehouses. Include in your discussion their definition and the three rules that define a data warehouse. **(5)**

[10]

QUESTION 8

8.1 Briefly discuss the concept of Client/Server computing. **(6)**

[6]

QUESTION 9

The MS Access database diagram below shows the tables created for the Auckland Park Fire Defence Association. The database currently allows the Auckland Park Fire Defence Association to keep track of their commanders, fire units and fire fighters.

Each Fire Fighter belongs to one Fire Defence Unit. A Unit can have multiple Fire Fighters. A Chief Commander can command several Fire Defence Units. A Fire Defence Unit can only be commanded by one Chief Commander.
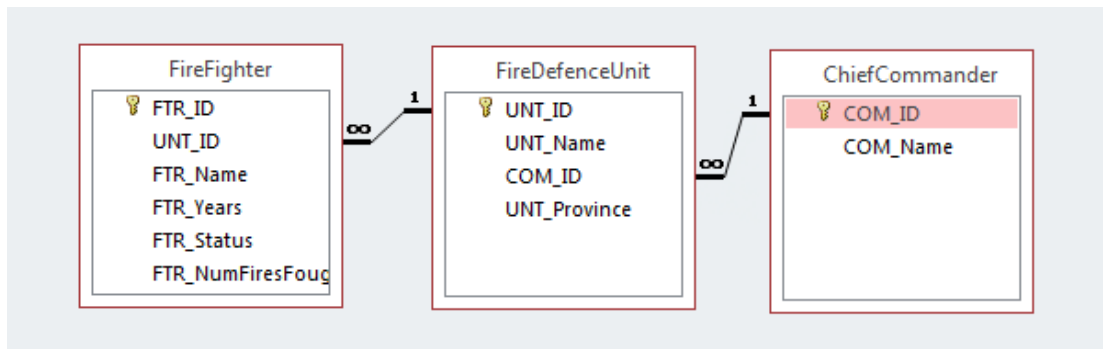
NB: You may assume no other tables exist in this database.

Answer the questions below by providing SQL statements:

9.1 How many Fire Defence Units are currently working on each province? **(3)**

9.2 List each Fire Defence Unit and the sum of all fires fought by all Fire Fighters on the Fire Defence Unit. **(4)**

9.3 List the name of each Fire Defence Units and its Chief Commander. Use an INNER JOIN in your SQL statement. **(3)**

[10]

QUESTION 10

Moto-Works is a car part store that has been operating in Soweto for the past thirty years. The company sells **(15)** 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]

TOTAL: 100 MARKS