



MODULE NAME:	MODULE CODE:
DATABASE (INTRODUCTION)	DATA6211/d/p

ASSESSMENT TYPE:	TAKE-HOME ASSESSMENT (PAPER ONLY)
TOTAL MARK ALLOCATION:	120 MARKS
TOTAL TIME:	This assessment should take you 2 Hours to complete, however you have 21 hours (midnight to 9pm on the same day) to submit. This additional time has been allocated to allow for the download, completion and upload of your submission.

By submitting this assessment, you acknowledge that you have read and understood all the rules as per the terms in the registration contract, in particular the assignment and assessment rules in The IIE Assessment Strategy and Policy (IIE009), the intellectual integrity and plagiarism rules in the Intellectual Integrity Policy (IIE023), as well as any rules and regulations published in the student portal.

INSTRUCTIONS:

1. Please **adhere to all instructions**. These instructions are different from what is normally present, so take time to go through these carefully.
2. **Independent work is required**. Students are not allowed to work together on this assessment. Any contraventions of this will be handled as per disciplinary procedures in The IIE policy.
3. **No material may be copied from original sources, even if referenced correctly, unless it is a direct quote indicated with quotation marks.**
4. All work must be adequately and correctly referenced.
5. You should paraphrase (use your own words) the concepts that you are referencing, rather than quoting directly.
6. Marks will be awarded for the quality of your paraphrasing.
7. This is an open-book assessment.
8. Assessments must be typed unless otherwise specified.
9. **Ensure that you save a copy of your responses.**
 - a. Complete your responses in a Word document.
 - b. The document name must be your **Name.Student number.Module Code**.
 - c. Once you have completed the assessment, upload your document under the **submission link** in the correct module in Learn.

Additional instructions:

- For open book assessments the students may have open access to all resources inclusive of notes, books (hardcopy and e-books) and the internet. These resources may be accessed as hard copies or as electronic files on electronic devices.
All electronic devices batteries must be fully charged before the assessment as no charging of devices will be permitted during the sitting of the assessment. The IIE and associated brands accept no liability for the loss or damage incurred to electronic devices used during open book assessments.
- Answer All Questions.

Question 1 (Marks: 10)

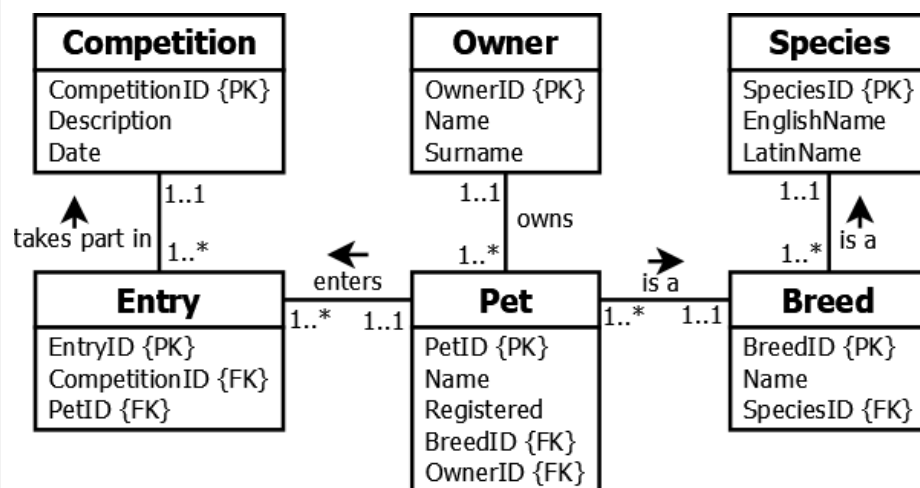
A database management system used within an insurance company is more than just software.

- | | | |
|--------------|---|-----|
| Q.1.1 | Define the term “application software” and provide an example of application software in the context of an insurance company. | (2) |
| Q.1.2 | Differentiate between the roles of system administrators and end-users in the organisation. | (4) |
| Q.1.3 | Describe any two functions of Database Management Software (DMBS). | (4) |

Question 2 (Marks: 10)

Entity Relationship Diagrams (ERDs) are useful for communication between business users and database designers.

- Q.2.1** Write down any four business rules that are represented in the below Entity Relationship Diagram (ERD).



(4)

Q.2.2	Which type of relationship is shown in each case below? Motivate your answer.	
Q.2.2.1	<pre> graph LR Branch[Branch] -- manages --> Employee[Employee] Branch --- B1[0..1] Employee --- E1[1..1] </pre>	(2)
Q.2.2.2	<pre> graph LR SpaceShuttle[SpaceShuttle] -- transports --> Astronaut[Astronaut] SpaceShuttle --- S1[*] Astronaut --- A1[*] </pre>	(2)

Q.2.2.3	<p>Table: Person</p> <p>Primary key: PersonID</p> <table border="1"> <thead> <tr> <th><u>PersonID</u></th><th>Surname</th><th>Name</th></tr> </thead> <tbody> <tr> <td>1</td><td>Modise</td><td>Dikeledi</td></tr> <tr> <td>2</td><td>Romano</td><td>Donatello</td></tr> </tbody> </table> <p>Table: Qualification</p> <p>Primary key: QualificationID</p> <p>Foreign key: PersonID</p> <table border="1"> <thead> <tr> <th>QualificationID</th><th>PersonID</th><th>Description</th></tr> </thead> <tbody> <tr> <td>97</td><td>1</td><td>BCIS (Application Development)</td></tr> <tr> <td>98</td><td>2</td><td>BCIS (Game Design and Development)</td></tr> <tr> <td>99</td><td>2</td><td>BA (Graphic Design)</td></tr> </tbody> </table>	<u>PersonID</u>	Surname	Name	1	Modise	Dikeledi	2	Romano	Donatello	QualificationID	PersonID	Description	97	1	BCIS (Application Development)	98	2	BCIS (Game Design and Development)	99	2	BA (Graphic Design)	(2)
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99	2	BA (Graphic Design)																					

Question 3**(Marks: 10)**

A key determines the values of other related attributes.

Q.3.1 Which column in the table Character below is a foreign key?

Table: Class

Primary key: ClassID

<u>ClassID</u>	Description	IsRanged
1	Warrior	False
2	Mage	True

Table: Character

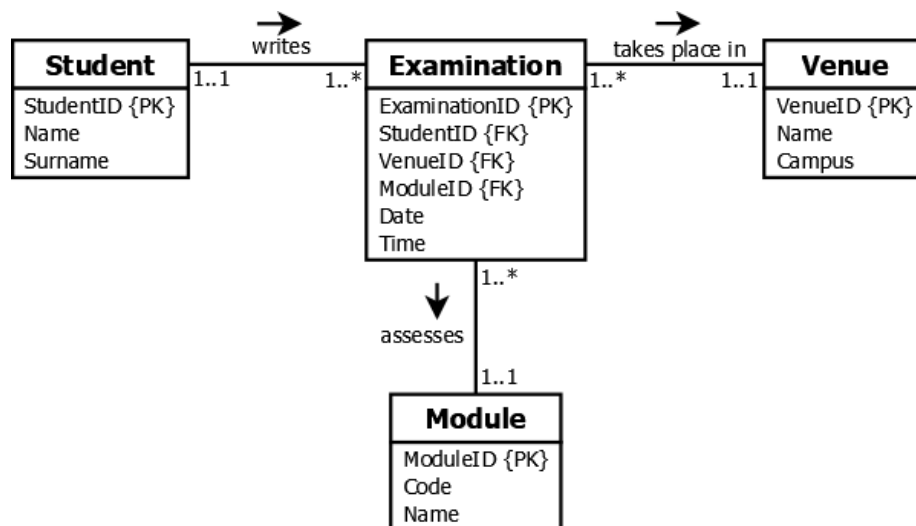
Primary key: CharacterID

Foreign key: ?

<u>CharacterID</u>	ClassID	Name	Level
476	2	Irumarim	70
477	1	Thudhengror	5

(1)

Q.3.2 Explain the relationship in the below Entity Relationship Diagram (ERD) in your own words.



(4)

Q.3.3 Answer the following questions by referring to the below sample data.

Table: Actor

ActorID	Surname	Name	Country	Genre
8	Bianchi	Anna	Italy	Drama
9	Smith	John	USA	Action
10	Nkosi	Lucky	South Africa	Comedy
11	Nkosi	Jabulani	South Africa	Drama

Q.3.3.1	Is the column Surname suitable to use as a primary key? Motivate your answer.	(2)
Q.3.3.2	Is the column Genre suitable to use as a secondary key? Motivate your answer.	(3)

Question 4**(Marks: 25)**

Unified Modelling Language (UML) is often used as a notation when drawing Entity-Relationship Diagrams (ERDs) since it is a notation that software developers are already familiar with.

Q.4.1	What is the difference between a binary relationship and a unary relationship? Provide an example of each as part of your answer.	(5)
Q.4.2	<p>Draw an Entity Relationship Diagram (ERD) using Unified Modelling Language (UML) notation according to the below business rules. Your design should be at the logical level – include primary and foreign key fields and remember to remove any many-to-many relationships.</p> <p>Tip: Pay attention to the mark allocation shown below.</p> <p>Legal system – business rules:</p> <ul style="list-style-type: none"> • In the legal system, a judge hears many cases throughout their career. • Each case can be heard by multiple judges in some circumstances. • A case has a date and title that needs to be recorded in the database. • The name and surname of each judge needs to be stored. • A judge can have multiple qualifications (with minimum of one), and each qualification is related to only one specific judge. • For a qualification, the institution, description and year completed should be recorded. 	(20)

- A case is defended by a single lawyer, but a lawyer can defend many cases in their career.
- The name and surname for each lawyer needs to be stored in the database.

Entities	5 marks
Relationships	4 marks
Multiplicities	4 marks
Primary keys	2 marks
Foreign keys	4 marks
Correct UML Notation	1 mark
Total	20 marks

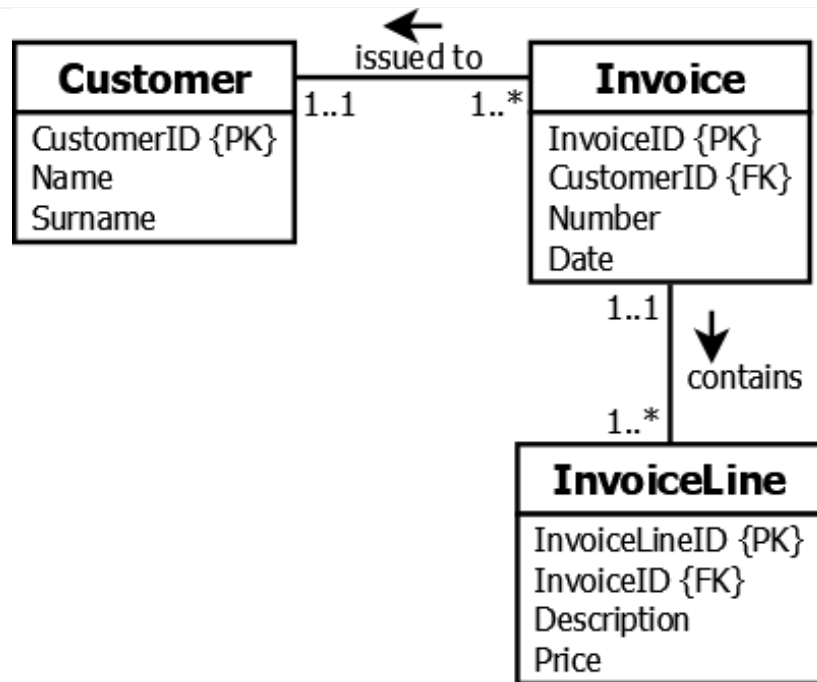
Question 5**(Marks: 30)**

The normalisation of table structures in a database is essential to eliminate data redundancies.

Q.5.1 What is the difference between the second normal form and the third normal form? (2)

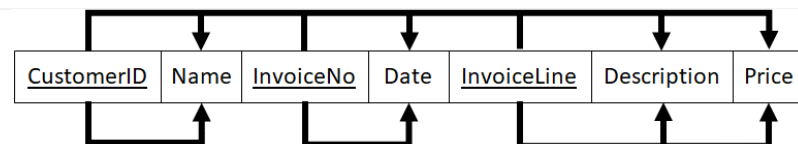
Q.5.2 In which normal form (unnormalised, first normal form, second normal form or third normal form) is each of the below? Clearly motivate your answer.

Q.5.2.1



(3)

Q.5.2.2



(3)

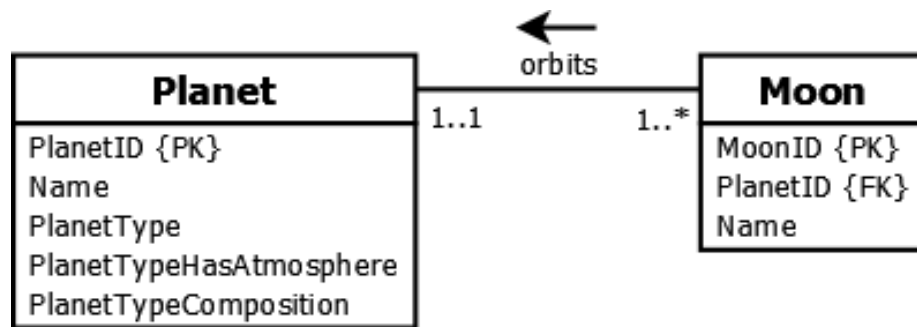
Q.5.2.3

Customer ID	Name	Invoice No	Date	Description	Price
1	Guy	546	2020/05/28	Thing 1	1000.55
				Thing 18	1.56
		578	2020/05/29	No Thing	98.99
2	Gal	21	2018/05/08	Thing 1	975.69
		22	2018/06/19	No Thing	1.00

(3)

Q.5.3

The below Entity Relationship Diagram (ERD) is in second normal form. Draw a new ERD in third normal form and explain the changes.



(7)

Q.5.4

The below data is in first normal form. Normalise the data to third normal form, showing all steps with explanations.

Dependency diagrams or tabular data are acceptable for the final answer.

Primary key: PlayerName, CharacterName

<u>Player Name</u>	Player DateJoined	<u>Character Name</u>	Character Level	Character Max Health
Bob	2014-12-31	George	50	800
Bob	2014-12-31	Fred	50	1200
Alice	2015-05-09	ZeAlice	21	350
Charles	2016-09-09	HisRoyalHighness	30	470
Delta	2020-02-29	WarriorDelta	50	1205
Delta	2020-02-29	DeltaMage	2	60

(12)

Question 6**(Marks: 35)**

Structured Query Language (SQL) is a language widely used in industry to create, update and query data in relational databases. You are required to write the SQL code.

Q.6.1

The below sample data in the third normal form was provided by a database designer. Answer the below questions using this data.

Table: LawFirm

Primary key: LawFirmID (auto number)

All fields are mandatory

<u>LawFirmID</u>	Name	YearIncorporated
1	Ze Boss Attorneys	2011
2	Lawyers for the Win	2018
3	Court Rulez	2019

Table: Lawyer

Primary key: LawyerID

Foreign key: LawFirmID

<u>LawyerID</u>	LawFirmID	Surname	Name	Age
6	1	Bianchi	Anna	45
7	2	Modise	Dikeledi	57
8	2	Ferreira	Piet	34
9	3	Nkosi	Jabulani	28

Q.6.1.1

Write a SQL statement to create the table Lawyer.

Hint: The sample data should give you an indication of the data types you should use.

(5)

Q.6.1.2

Write a SQL statement that will calculate the average age of all the lawyers that are at least 40 years old.

(4)

Q.6.1.3

Write a SQL statement to insert the below row into table LawFirm.

(4)

		<table><tr><th>LawFirmID</th><th>Name</th><th>YearIncorporated</th></tr><tr><td>4</td><td>Wicked and Righteous</td><td>2020</td></tr></table>	LawFirmID	Name	YearIncorporated	4	Wicked and Righteous	2020			
LawFirmID	Name	YearIncorporated									
4	Wicked and Righteous	2020									
	Q.6.1.4	Write a SQL statement to get the list of all the law firms from the database in alphabetical order by firm name. Include all the columns from the LawFirm table.	(3)								
	Q.6.1.5	Write a SQL statement to get the list of all the law firms with a name that contains the letter Z. Include all fields from the LawFirm table.	(3)								
	Q.6.1.6	Write a SQL statement to get the list of all the lawyers, showing only the name and surname of the lawyer, and the name of their firm.	(5)								
Q.6.2		What is the difference between the WHERE and HAVING clauses in SQL statements?	(4)								
Q.6.3		What is the purpose of an index in a SQL database?	(1)								
Q.6.4.		<p>The below ERD has been implemented in a SQL database. What will the result be of each of the below queries? Explain your answer.</p> <div><div><table><tr><th>RacingTeam</th></tr><tr><td>RacingTeamID {PK}</td></tr><tr><td>Name</td></tr></table></div><div><table><tr><th>Driver</th></tr><tr><td>DriverID {PK}</td></tr><tr><td>RacingTeamID {FK}</td></tr><tr><td>Name</td></tr><tr><td>Surname</td></tr></table></div><div><p>← races for</p><p>1..1 1..*</p></div></div> <p>All attributes are mandatory All primary keys are auto number fields No attributes have default values</p>	RacingTeam	RacingTeamID {PK}	Name	Driver	DriverID {PK}	RacingTeamID {FK}	Name	Surname	
RacingTeam											
RacingTeamID {PK}											
Name											
Driver											
DriverID {PK}											
RacingTeamID {FK}											
Name											
Surname											
	Q.6.4.1	<pre>INSERT INTO Driver (RacingTeamID, Name) VALUES (1, "B");</pre>	(2)								

	Q.6.4.2	<pre>SELECT t.Name, COUNT(*) as DriverCount FROM RacingTeam t JOIN Driver d ON t.RacingTeamID = d.RacingTeamID GROUP BY t.RacingTeamID HAVING DriverCount = 2;</pre>	(2)
	Q.6.4.3	<pre>DROP TABLE RacingTeam;</pre>	(2)

END OF PAPER