



MODULE NAME:	MODULE CODE:
DATABASE (INTRODUCTION)	DATA6211
DATABASE (INTRODUCTION)	DATA6211d
DATABASE (INTRODUCTION)	DATA6211p

ASSESSMENT TYPE:	REVISED EXAM PAPER
TOTAL MARK ALLOCATION:	120 MARKS
TOTAL TIME:	The time given to students to complete this assessment will be indicated on your module in Learn.

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. This is an individual assessment.
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.**

Additional instructions:

- Answer All Questions .
- Instructions for assessments including sketches and diagrams:
 - You need to create the drawing on a piece of paper (A4) using either pen or pencil.
 - Your drawing does not have to be to scale.
 - Annotate each component of your drawing as indicated in the question.
 - Please work neatly so that you do not lose marks because your lecturer cannot read your writing.
 - Either (i) Scan your pages OR (ii) clearly photograph your pages.
 - Label your photographs/scans as follows: **name.student number.Module Code.Page 1; (for each drawing)**

Referencing Rubric

Providing evidence based on valid and referenced academic sources is a fundamental educational principle and the cornerstone of high-quality academic work. Hence, The IIE considers it essential to develop the referencing skills of our students in our commitment to achieve high academic standards. Part of achieving these high standards is referencing in a way that is consistent, technically correct and congruent. This is not plagiarism, which is handled differently.

Poor quality formatting in your referencing will result in a penalty of **a maximum of ten percent being deducted from the percentage awarded**, according to the following guidelines. Please note, however, that **evidence of plagiarism in the form of copied or uncited work (not referenced), absent reference lists, or exceptionally poor referencing, may result in action being taken in accordance with The IIE's Intellectual Integrity Policy (0023)**.

Markers are required to provide feedback to students by indicating **(circling/underlining) the information that best describes the student's work.**

Minor technical referencing errors: 5% deduction from the overall percentage – the student's work contains **five or more errors** listed in the minor errors column in the table below.

Major technical referencing errors: 10% deduction from the overall percentage – the student's work contains **five or more errors** listed in the major errors column in the table below.

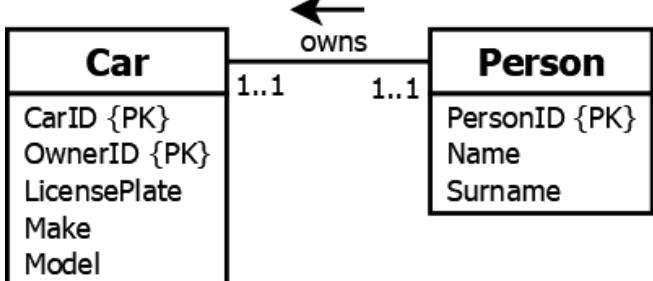
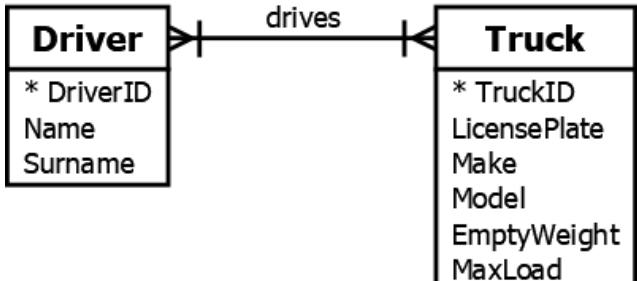
If both minor and major errors are indicated, then 10% only (and not 5% or 15%) is deducted from the overall percentage. The examples provided below are not exhaustive but are provided to illustrate the error

Required: Technically correct referencing style	Minor errors in technical correctness of referencing style Deduct 5% from percentage awarded	Major errors in technical correctness of referencing style Deduct 10% from percentage awarded
Consistency <ul style="list-style-type: none"> The same referencing format has been used for all in-text references and in the bibliography/reference list. 	Minor inconsistencies. <ul style="list-style-type: none"> The referencing style is generally consistent, but there are one or two changes in the format of in-text referencing and/or in the bibliography. For example, page numbers for direct quotes (in-text) have been provided for one source, but not in another instance. Two book chapters (bibliography) have been referenced in the bibliography in two different formats. 	Major inconsistencies. <ul style="list-style-type: none"> Poor and inconsistent referencing style used in-text and/or in the bibliography/ reference list. Multiple formats for the same type of referencing have been used. For example, the format for direct quotes (in-text) and/or book chapters (bibliography/ reference list) is different across multiple instances.
Technical correctness <ul style="list-style-type: none"> Referencing format is technically correct throughout the submission. Position of the reference: a reference is directly associated with every concept or idea. For example, quotation marks, page numbers, years, etc. are applied correctly, sources in the bibliography/reference list are correctly presented. 	Generally, technically correct with some minor errors. <ul style="list-style-type: none"> The correct referencing format has been consistently used, but there are one or two errors. Concepts and ideas are typically referenced, but a reference is missing from one small section of the work. Position of the references: references are only given at the beginning or end of every paragraph. For example, the student has incorrectly presented direct quotes (in-text) and/or book chapters (bibliography/reference list). 	Technically incorrect. <ul style="list-style-type: none"> The referencing format is incorrect. Concepts and ideas are typically referenced, but a reference is missing from small sections of the work. Position of the references: references are only given at the beginning or end of large sections of work. For example, incorrect author information is provided, no year of publication is provided, quotation marks and/or page numbers for direct quotes missing, page numbers are provided for paraphrased material, the incorrect punctuation is used (in-text); the bibliography/reference list is not in alphabetical order, the incorrect format for a book chapter/journal article is used, information is missing e.g. no place of publication had been provided (bibliography); repeated sources on the reference list.
Congruence between in-text referencing and bibliography/reference list <ul style="list-style-type: none"> All sources are accurately reflected and are all accurately included in the bibliography/reference list. 	Generally, congruence between the in-text referencing and the bibliography/reference list with one or two errors. <ul style="list-style-type: none"> There is largely a match between the sources presented in-text and the bibliography. For example, a source appears in the text, but not in the bibliography/reference list or vice versa. 	A lack of congruence between the in-text referencing and the bibliography. <ul style="list-style-type: none"> No relationship/several incongruencies between the in-text referencing and the bibliography/reference list. For example, sources are included in-text, but not in the bibliography and vice versa, a link, rather than the actual reference is provided in the bibliography.
In summary: the recording of references is accurate and complete.	In summary, at least 80% of the sources are correctly reflected and included in a reference list.	In summary, at least 60% of the sources are incorrectly reflected and/or not included in reference list.

Overall Feedback about the consistency, technical correctness and congruence between in-text referencing and bibliography:

Question 1		(Marks: 10)
Data is now the most valuable resource in business, surpassing oil in value.		
Q.1.1	What is the difference between data and information?	(2)
Q.1.2	List five advantages of implementing a database management system (DBMS) in an organisation.	(5)
Q.1.3	Define in your own words the term database access language and provide one example of such a language.	(3)

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).	
	<pre> erDiagram { class Competition { string CompetitionID { constraint primary key } string Description string Date } class Owner { string OwnerID { constraint primary key } string Name string Surname } class Species { string SpeciesID { constraint primary key } string EnglishName string LatinName } class Entry { string EntryID { constraint primary key } string CompetitionID { constraint foreign key references Competition.CompetitionID } string PetID { constraint foreign key references Pet.PetID } } class Pet { string PetID { constraint primary key } string Name string Registered string BreedID { constraint foreign key references Breed.BreedID } string OwnerID { constraint foreign key references Owner.OwnerID } } class Breed { string BreedID { constraint primary key } string Name string SpeciesID { constraint foreign key references Species.SpeciesID } } Competition }o--o{ Entry : "takes part in" Entry }o--o{ Pet : "enters" Owner }o--o{ Pet : "owns" Pet }o--o{ Breed : "is a" Species }o--o{ Breed : "is a" } </pre>	(4)

Q.2.2	<p>Which type of relationship is shown in each case below? Motivate your answer.</p>																						
Q.2.2.1	 <pre> classDiagram class Car { CarID {PK} OwnerID {PK} LicensePlate Make Model } class Person { PersonID {PK} Name Surname } Car "1..1" --> "1..1" Person : owns </pre>	(2)																					
Q.2.2.2	 <pre> classDiagram class Driver { * DriverID Name Surname } class Truck { * TruckID LicensePlate Make Model EmptyWeight MaxLoad } Driver "1..1" --> "1..1" Truck : drives </pre>	(2)																					
Q.2.2.3	<p>Table: Country Primary key: CountryID</p> <table border="1" data-bbox="502 1058 1263 1220"> <thead> <tr> <th>CountryID</th> <th>Name</th> <th>Abbreviation</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>South Africa</td> <td>ZA</td> </tr> <tr> <td>2</td> <td>Zimbabwe</td> <td>ZW</td> </tr> </tbody> </table> <p>Table: Province Primary key: ProvinceID Foreign key: CountryID</p> <table border="1" data-bbox="502 1417 1263 1622"> <thead> <tr> <th>ProvinceID</th> <th>CountryID</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>36</td> <td>1</td> <td>Gauteng</td> </tr> <tr> <td>37</td> <td>1</td> <td>KwaZulu-Natal</td> </tr> <tr> <td>38</td> <td>2</td> <td>Mashonaland East</td> </tr> </tbody> </table>	CountryID	Name	Abbreviation	1	South Africa	ZA	2	Zimbabwe	ZW	ProvinceID	CountryID	Name	36	1	Gauteng	37	1	KwaZulu-Natal	38	2	Mashonaland East	(2)
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Question 3**(Marks: 10)**

A key determines the values of other related attributes.

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

Table: Class

Primary key: ClassID

ClassID	Description	IsRanged
1	Warrior	False
2	Mage	True

Table: Character

Primary key: CharacterID

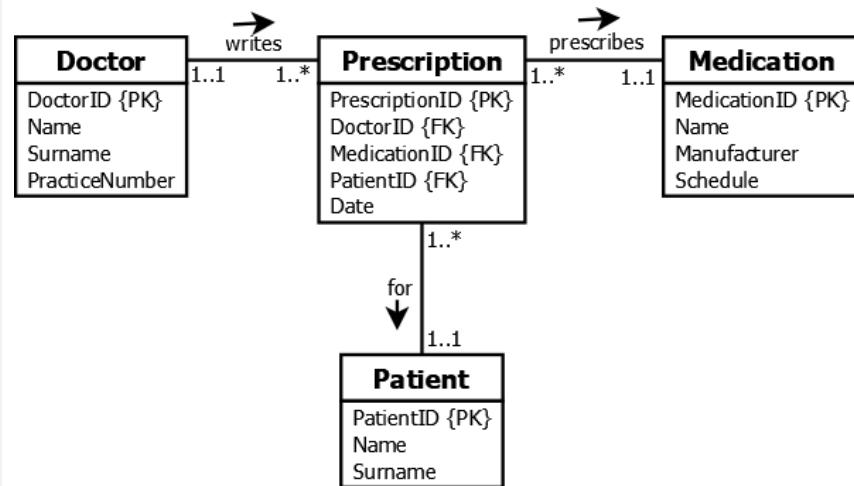
Foreign key: ?

CharacterID	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: Client																											
<table border="1"> <thead> <tr> <th>ClientID</th><th>Surname</th><th>Name</th><th>City</th><th>Cellphone</th></tr> </thead> <tbody> <tr> <td>1</td><td>Modise</td><td>Dikeledi</td><td>Johannesburg</td><td>083 123 4567</td></tr> <tr> <td>2</td><td>Romano</td><td>Donatello</td><td>Durban</td><td>081 765 4321</td></tr> <tr> <td>3</td><td>Ferreira</td><td>Piet</td><td>Cape Town</td><td>089 101 1010</td></tr> <tr> <td>4</td><td>Modise</td><td>Gorata</td><td>Johannesburg</td><td>083 123 4567</td></tr> </tbody> </table>			ClientID	Surname	Name	City	Cellphone	1	Modise	Dikeledi	Johannesburg	083 123 4567	2	Romano	Donatello	Durban	081 765 4321	3	Ferreira	Piet	Cape Town	089 101 1010	4	Modise	Gorata	Johannesburg	083 123 4567
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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 City suitable to use as a secondary key? Motivate your answer.	(3)																									

Question 4	(Marks: 25)
Unified Modelling Language (UML) is often used as 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	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. Tip: Pay attention to the mark allocation shown below. Movie meta-data – business rules: <ul style="list-style-type: none">• A website about the film industry wants to store data about movies.• A movie contains several scenes (at least one), and a scene will never be used in more than one movie. (20)

- | |
|--|
| <ul style="list-style-type: none"> A character makes appearances in (potentially) many different scenes, and a single scene can have any number of characters that appear in it. Some characters are legally married to exactly one other character. |
|--|

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

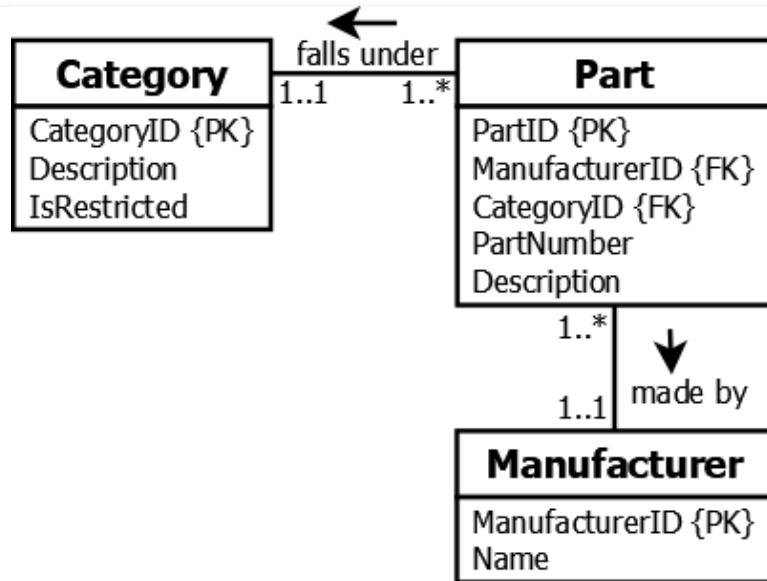
Question 5 (Marks: 30)

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

Q.5.1 What is the difference between second normal form and 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	<table border="1"> <tr> <td>PartNumber</td> <td>Description</td> <td>Manufacturer</td> <td>Category</td> <td>IsRestricted</td> </tr> </table>	PartNumber	Description	Manufacturer	Category	IsRestricted	(3)										
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Guns'r'Us	G1 G891-2	Cannon Keyboard	Artillery Input Gun	Yes No Yes													

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.	
	<pre> classDiagram class Star { StarID {PK} Name Mass StarType StarTypeDescription StarTypeColour } class Planet { PlanetID {PK} StarID {FK} Name Distance } Star "1..1" --> "1..*" Planet : orbits </pre>	(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, SpaceshipRegistration																					
	<table border="1"> <thead> <tr> <th>Player Name</th> <th>Player DateJoined</th> <th>Spaceship Registration</th> <th>Spaceship Name</th> <th>Spaceship Value</th> </tr> </thead> <tbody> <tr> <td>Bob</td> <td>2014-12-31</td> <td>SWA</td> <td>Big Ship</td> <td>2 000 000</td> </tr> <tr> <td>Bob</td> <td>2014-12-31</td> <td>LZH</td> <td>Medium Ship</td> <td>400 000</td> </tr> <tr> <td>Alice</td> <td>2015-05-09</td> <td>ALO</td> <td>Flea</td> <td>10 000</td> </tr> </tbody> </table>	Player Name	Player DateJoined	Spaceship Registration	Spaceship Name	Spaceship Value	Bob	2014-12-31	SWA	Big Ship	2 000 000	Bob	2014-12-31	LZH	Medium Ship	400 000	Alice	2015-05-09	ALO	Flea	10 000	(12)
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Alice	2015-05-09	ALO	Flea	10 000																		

	Charles	2016-09-09	MOO	Cow Mobile	200 000	
	Delta	2020-02-29	ZZE	Truck	1 200 000	
	Delta	2020-02-29	QAR	Zippy	780 000	

Question 6**(Marks: 35)**

Structured Query Language (SQL) is a language that is widely used in industry to create, update and query data in relational databases.

This question must NOT be done practically (i.e. in the computer room). You are required to write the SQL code in your answer book.

Q.6.1

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

Table: Country

Primary key: CountryID (auto number)

All fields are mandatory

CountryID	Name	Abbreviation	CallingCode
1	South Africa	ZA	27
2	Lesotho	LS	266
3	Namibia	NA	264
4	Egypt	EG	20

Table: President

Primary key: PresidentID (auto number)

Foreign key: CountryID (mandatory)

All fields are mandatory

PresidentID	CountryID	Name	Surname	Year
1	1	Cyril	Ramaphosa	2018
2	1	Jacob	Zuma	2009
3	3	Hage	Geingob	2015
4	3	Hifikepunye	Pohamba	2005

	Q.6.1.1	Write a SQL statement to create the table President. 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 count the number of presidents that were inaugurated after 2009.	(4)								
	Q.6.1.3	Write a SQL statement to insert the below row into table Country.									
		<table border="1"> <thead> <tr> <th>CountryID</th><th>Name</th><th>Abbreviation</th><th>CallingCode</th></tr> </thead> <tbody> <tr> <td>5</td><td>Botswana</td><td>BW</td><td>267</td></tr> </tbody> </table>	CountryID	Name	Abbreviation	CallingCode	5	Botswana	BW	267	(4)
CountryID	Name	Abbreviation	CallingCode								
5	Botswana	BW	267								
	Q.6.1.4	Write a SQL statement to get the list of all the countries from the database, in alphabetical order by country name. Include all the columns from the Country table.	(3)								
	Q.6.1.5	Write a SQL statement to get the list of all the presidents with a surname starting with the letter R. Include all fields from the President table.	(3)								
	Q.6.1.6	Write a SQL statement to get the list of all the presidents, showing only the name and surname of the president, and the name of their country.	(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.	The below ERD has been implemented in a SQL database. What will the result be of each of the below queries? Provide an explanation for your answer.										

	<pre> classDiagram class Judge { JudgeID {PK} Name Surname } class CourtCase { CourtCaseID {PK} JudgeID {FK} CaseNumber Date } Judge "1..1" --> "1..*" CourtCase : hears </pre> <p>All attributes are mandatory All primary keys are auto number fields No attributes have default values</p>	
	<p>Q.6.4.1 <code>INSERT INTO Judge (Name) VALUES ("Abe");</code></p>	(2)
	<p>Q.6.4.2 <code>SELECT j.*, COUNT(*) AS CaseCount FROM Judge j JOIN CourtCase c ON j.JudgeID = c.JudgeID GROUP BY j.JudgeID HAVING CaseCount >= 2;</code></p>	(2)
	<p>Q.6.4.3 <code>DROP TABLE Judge;</code></p>	(2)

END OF PAPER