



**ST PETER'S
COLLEGE**
1998 - 2018 **20**
YEARS

LEARNING AREA: TECHNOLOGY
SUBJECT: INFORMATION TECHNOLOGY

GRADE 12 APRIL EXAMINATION

NORMALISATION

EXTERNAL MODERATOR: MR C. BRADLEY

TOTAL MARKS: 50 MARKS

TIME: 60 MINUTES

DATE: 10 APRIL 2018

EXAMINER: MS S. RONNE

MODERATORS: MS N. SANGWENI

MR L. LEVINSON

NAME: _____

PATH: _____

Read the following instructions carefully before attempting the answers:

1. Write your name on the front cover of this booklet.
2. Read and answer all questions neatly and legibly. It is in your interest to present your work neatly.
3. All the questions are to be completed in the spaces provided.
4. Use the mark allocation as an indication of the number of facts required.
5. The use of acronyms is permitted, unless the question specifically asks for the abbreviation to be expanded.
6. Don't give vague answers – motivate your answers and give examples where possible.
7. Give your answers in general terms. Use brand names only when giving examples. For example, use the term 'word processor' rather than 'Word' or 'WordPerfect'.
8. You may include diagrams and examples in your answer even if the question does not ask for it.
9. Neatly cross out ALL rough work before handing in your answer book.
10. A non-programmable calculator may be used.
11. This paper consists of 8 pages, which includes the front cover and a separate single page insert with sample data for the scenario. Make sure that they are all there before starting.

Paul Steele manages as small Bed and Breakfast in Hothazel. He keeps track of his clients and well as their expenditure on extra services he offers like the internet, washing, telephone calls and the like. As part of his planning and setup he needs to create a database to contain information on the people ordering movies on the internet.

QUESTION 1: TERMINOLOGY

1.1 Define the following Database Terms:

1.1.1 Normalisation (3)

1.1.2 Primary Key (2)

1.1.3 Foreign Key (2)

1.1.4 Entity Integrity (2)

1.1.5 Transitive Dependency (2)

- 1.1.6 Composite Key (1)
- 1.2 Explain the difference between Duplicate Data and Redundant Data. (2)
- 1.3 Explain the term Anomalies. (3)
- 1.4 List one data type used in a database, that is not common in Delphi? (1)
- 1.5 Differentiate between a Candidate Key and a Composite Key. (2)
- [20]

QUESTION 2: PROCESS OF NORMALISATION

Paul has suggested a table design that looks as follows:

	Field Name	Data Type	
🔑	ID	AutoNumber	
	ClientCode	Short Text	Code added to identify a client
	Title	Short Text	Title of Client = {Mr, Mrs, Ms}
	Surname	Short Text	Surname Of client
	FName	Short Text	FirstNameof Client
	IDNum	Short Text	Identification Number
	SA	Yes/No	South African Citizen?
	Nationality	Short Text	Country of Origin
	O_No1	Number	Order No of Item
	CatID1	Short Text	Catergory of Item
	Item1	Short Text	Descirpition of Item
	Date1	Short Text	Date of Item
	Charge1	Currency	Cost of Item
	O_No2	Number	Order Number of Item
	CatID2	Short Text	Category of Item
	Item2	Short Text	Description of Item
	Date2	Short Text	Date of Item
	Charge2	Currency	Charge of Item

NOTE: There is sample data included at the end of the examination to help you understand the scenario.

2.1. Give two reasons why the primary key he has chosen is not a good idea? (2)

2.2. Analyse the proposed table and justify why this design would suffer from an Update Anomaly. Sample data has been provided in Addendum A. (3)

- 2.3. Databases that have not been normalised suffer from Anomalies. Use the above table and explain in detail an Insert Anomaly that this database would suffer. (2)
- 2.4. Paul has asked you to examine the database design to make sure it is as effective and efficient as possible. This means that you must normalise the database.
- 2.4.1. This table is in NNF. Substantiate this statement by listing the rules for 1NF and then using them to identify which of the requirements it does not fulfill. (3)
- 2.5. After your explanation about the primary key chosen (see questions 2.1), Paul doesn't know which primary key to choose. Explain the process of choosing a primary key, by defining Super Keys and Candidate Keys and how they are used in the process. (3)

2.6 Paul realised that if a person orders more than two services during their stay his table will not work. He asks his friend Cameron for assistance.

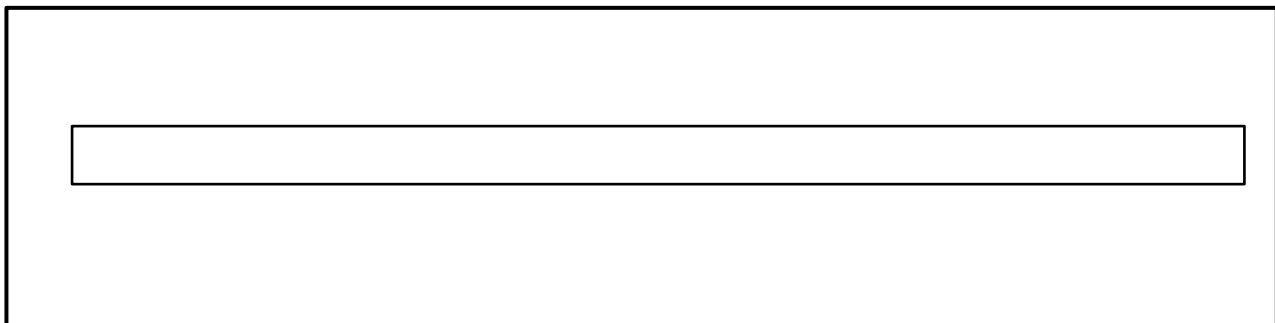
Cameron Love proposes the following database design:

Clients_TBL(ClientCode(PK), OrderNum(PK), Title, Surname, FName, IDNum, SA Nationality, CategoryID, Item, Date, Charge)

2.6.1 Draw a dependency Diagram to show all Partial and Transitive Dependents. (2)

You may shorten the field names as follows:

Clients_TBL (CCode(PK), ONum(PK), Title, SName, FName, IDNum, SA, CatID, Item, Date, Charge)



2.7. Normalise the table to 3NF. All the original fields given in the table, except ID, must appear in your new design. You can add extra field(s) to accommodate the normalisation process. Write your answer in relational notation.

Show the following as part of your design:

- The fields that make up the new tables. This must include all the fields from the original table as well as any extra field(s) that you will need to achieve 3NF.
- Primary key(s) (PK)
- Foreign key(s) (FK)

(5)

2.8. Explain to Paul what partial dependencies and transitive dependencies are, by referring to the table above. (4)

2.9. Explain the term Referential Integrity. (2)

2.10. Using an example, explain how your proposed solution will enforce referential integrity. (2)

2.11. Use a diagram OR a set of relations to describe how the many-to-many relationship that clients and services suffered has been eliminated. (2)

[30]

GRAND TOTAL: 50 MARKS

ADDENDUM A: Sample DATA

ClientCode	Title	Surname	FName	IDNumber	SA	Nationality	O_No1	CatID1	Item1	Date1	Charge1	O_No2	CatID2	Item2	Date2	Charge2
Grif231107	Mr	Griffiths	Daffyd	2311078237876	FALSE	Welsh	1	P1	Phone Call	2017/03/17	R 22.86	22	I1	Internet	2017/03/21	R 14.95
Ferr371218	Mr	Ferreira	Guissepe	3712183567065	FALSE	Portuguese	2	P1	Phone Call	2017/03/18	R 8.75	23	K1	Kitchen	2017/03/6	R 29.95
Bekk560718	Mr	Bekker	Hendrik	5607187367892	TRUE	SA	3	K1	Kitchen	2017/03/11	R 49.95	24	I1	Internet	2017/03/31	R 14.95
Von 560823	Ms	Von Braun	Gertrude	5608237896212	FALSE	German	4	W1	Wakeup Call	2017/03/23	R12.50	25	P1	Phone Call	2017/03/20	R 18.75
Bake561213	Ms	Baker	Jean	5612130067143	FALSE	English	5	K1	Kitchen	2017/03/28	R 29.95	26	S1	Security	2017/03/21	R 30.00
Hone590723	Mrs	Honeywell	Lucy	5907234676012	TRUE	SA	6	W1	Wakeup Call	2017/03/12	R12.50	27	K1	Kitchen	2017/03/21	R 29.95
Van631205	Mrs	Van Rheede	Roxanne	6312054763457	FALSE	Dutch	7	S1	Security	2017/03/30	R 30.00	28	K1	Kitchen	2017/03/29	R 29.95
Sain661027	Mr	Saint-Ypres	Yves	6610278547278	FALSE	French	8	K1	Kitchen	2017/03/25	R 160.95	29	S1	Security	2017/03/3	R 30.00
Mend670813	Ms	Mendes	Isaac	6708139075176	TRUE	SA	9	K1	Kitchen	2017/03/7	R 59.95	30	I1	Internet	2017/03/29	R 14.95
Krzy730517	Ms	Krzyaiais	Stavro	7305172654765	FALSE	Greek	10	P1	Phone Call	2017/03/9	R 20.86	31				
Kowa740718	Mr	Kowalski	Joachim	7407189162348	FALSE	Polish	11	P1	Phone Call	2017/03/12	R 18.75	32	K1	Kitchen	2017/03/8	R 29.95
Smyt741028	Mr	Smythe	Andrew	7410287656786	FALSE	English	12	S1	Security	2017/03/25	R 30.00	33	I1	Internet	2017/03/31	R 14.95
Ngun760924	Ms	Nguni	Priscilla	7609248768934	TRUE	SA	13	W1	Wakeup Call	2017/03/17	R12.50	34	B1	Bar	2017/03/18	R 189.95
Khoz770616	Mr	Khoza	Bantu	7706161545342	TRUE	SA	14	W1	Wakeup Call	2017/03/18	R12.50	35				
Bekk771014	Mr	Bekker	Boris	7710145678083	FALSE	German	15	W2	Washing	2017/03/24	R120.50	36	P1	Phone Call	2017/03/4	R 18.75
Fouc780526	Mr	Fouche	Jean-Claude	7805263478653	FALSE	French	16	W2	Washing	2017/03/1	R120.50	37	S1	Security	2017/03/28	R 30.00
Yami790718	Mr	Yamimoto	Ishiguru	7907186427868	FALSE	Japanese	17	B1	Bar	2017/03/29	R 189.95	38	B1	Bar	2017/03/2	R 80.95
John800202	Mr	Johnstone	Paul	8002027876086	FALSE	English	18	B1	Bar	2017/03/22	R 789.95	39	B1	Bar	2017/03/5	R 86.95
Kowa801223	Ms	Kowalski	Nikitha	8012230067083	FALSE	Polish	19	B1	Bar	2017/03/1	R 59.95	40	B1	Bar	2017/03/3	R 8.95
Freu810716	Mrs	Freulich	Ina	8107166893475	FALSE	German	20	W2	Washing	2017/03/4	R120.50	41				
Rodr821126	Ms	Rodriguez	Laura	8211263788743	FALSE	Spanish	21	T1	Taxi	2017/03/11	R 159.00	42	I1	Internet	2017/03/8	R 14.95