



12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

SURNAME: Southern

FORENAME(S): James

1	Student Number	~~JS103556~~ JS103556
2	Title of Examination Paper	Database Management System
3	Module Code	ACCA 5014
4	Date and Time of Examination	9th May 19 9.05 Am
5	Examination Venue	G 42
6	Seat Number	
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
~~Question 1~~	
2	152
3	18
4	24
Total	57 1/2

(Gweler yr ochr arall am y fersiwn Cymraeg)

Question

1

i. Create table TutorBooking

Booking Ref Int Not Null

Booking Date Datetime Not Null

Tutor No Int Not Null

Student No Int Not Null

Subject Id Char Not Null

Subject Level Char Not Null ~~Char~~ Char(5) Not NullHourly Rate ~~Varchar~~ Varchar(5) Not Null

];

Go

ii. Alter TABLE TutorBooking

ADD CONSTRAINT P-k Booking Ref PRIMARY KEY Booking Ref

iii. ALTER TABLE TutorBooking

ADD CONSTRAINT F-k Tutor FOREIGN KEY Tutor No
References Tutor(Tutor No);ADD constraint F-k Subject foreign key Subject No
References Subject(Subject No);Add constraint F-k Student foreign key Student No
References Student(Student No);

Question No.

iv. Create Table Tutor Subject C

Tutor No int Not Null Primary Key

Subject Id int Not Null Foreign Key (Subject Id)
References Subject (Subject Id)

KS Level char (5) Not Null

A Level char (5) Not Null

HE Level char (11) Not Null

Min Hourly Rate Varchar (6) Not Null

Max Hourly Rate Varchar (6) Not Null

(Check Max Hourly Rate $\Rightarrow$ 10)

delete?

Composite?

delete?

Select Tutor No, First Name, Surname, Email, Phone No
From Tutor

Where DBS Expiry Date = 'Between Check date And 30-06-19'

Order by ASC

ii. Select DBS Expiry Date, Status
From Tutor

Where

Status = 'Pending DBS Check'

Insert Into Status # ('Pending DBS Check')

Where DBS Expiry Date =

iii. Select Min C
From

0

152

Question

3. A. Database User

- Blackmail - the user could be blackmailed, or black mail the business to extract money/information from the business ✓
- Introduce Virus - The user could try to install a virus into the database to damage/steal from the database ✓
- Inadequate training - User may not know how to use the database system properly and accidentally damage the system ✓

Hardware

- Fire/Flood/other disaster - Hardware could be damage/destroyed by a disaster, and will have to be rebuilt, with potential data loss ✓
- Theft - Various hardware such as hard disks, servers, etc could be stolen, thus causing loss of data availability ✓

- **Electrical Surge** - A power failure could damage sensitive hardware, and lead to loss of data availability.
- **Programmer/Admin**
 - **Could Install Trapdoor** - ~~App~~ Programmer may install malicious software to gain access to sensitive database areas.
 - **Inadequate training** - may not understand how system work and makes changes to system that effects the system/users negatively.
- DBMS System**
 - **Update Issues/DBMS Version** - A new update or could make changes that damage the database structure.
 - **Power failure during update of DBMS** could create glitches in the system, resulting in loss of data availability.

- B i**
- Authentication** - a mechanism for determining who a user claims to be. It is a way to verify the users identity.
- Passwords, Identifiers and User accounts are the most common methods of authentication.
 - Authentication can be done at system level, but is also useful at database level.
 - **Accountability** - a security log can be kept and maintained to ensure accountability. For example, a user gains unauthorised access to data can be held accountable.

- ii. Access Control and User Privileges** - a mechanism for access control towards the database and database resources.

- Granting and Revoking privileges from users is the main method used.
- In SQL, **authorised access** is used to grant a user an object in the database and what they can do with the object.

1. A user can be granted privileges based on their role, such as a HR manager being able to add/delete records from an employee table.

Views - a mechanism for implementing access control in a database

- Is a flexible and secure way of providing security in a database by hiding parts of the database from a user and only ~~show~~ showing parts that relevant to the user.
- A View can ~~have~~ have many base relations, ~~to~~ with the user having access to the View but not the base relations.
- Where clauses can be used to further restrict access to data where only data that pertains to the ~~where~~ users access level. For example, sensitive data ~~to~~ for managers and higher, the database would check
A view that has sensitive data can only be seen by a user WHERE user = 'Manager', 'DBA' levels. Users that are not ~~the~~ DBA or a manager cannot see ~~the~~ or use the Views.

C1. Create View Active Tutors

Select Firstname, Email, City, Subject, KS level, HE level, S1 Status
From Tutors ~~inner join~~
~~where Status = S1 Status on S1 tables = S1 Status~~
~~inner join~~ where Status = 'Active'

print
min

exhibits

4 a.

Atomicity - Is where it is guaranteed that if the changes made will be either carried out or not carried out, ~~but~~ but you will never be left in a half state, Complex operations will be processed as one unit.

Consistency - Is where ^{changes to data} changes will be consistent and no violate any constraints set on data.

Isolation - Is where transactions will be kept ~~isolated~~ isolated from each other, transactions that ~~run~~ run ~~concurrently~~ concurrently will view the ~~world~~ world sequentially from each other.

Durability - ensures that changes made will be saved after they are done, and the fact that the change has been saved is also saved.

- b. **Concurrency Controls** is a mechanism to ensure that simultaneous operations do not interfere with each other.
Operations such as ~~the~~ all transactions will operate sequentially from each other so as not to interfere with each other.

C.i. Lost Update - Where ~~an~~ ^{two} transactions makes a change on one particular column on one particular row at the same time. The first ~~row~~ transaction makes a change, the second transaction doesn't see the changes, and updates the old value instead.

ii. Uncommitted Dependancy - Where one transaction attempts to make a change but aborts. A second transaction sees the ~~for~~ aborted change and retrieves it instead of the original value.

iii. inconsistent analysis - Where a transaction reads multiple columns that a second transaction is making changes to but has not committed yet. The first transaction will retrieve inaccurate data.

C.ii. The lost update occurs where two transactions are trying to update the same row. The second transaction doesn't see the first transaction's update to 800, and updates the old balance of 500 to 490, where it should actually be 550.

The timelock protocol can be used to stop the second transaction from making changes until the ~~see~~ first transaction is complete.



- d.
- i. T4 will need to be redone as it was past the checkpoint and so was not fully committed.
 - ii. T3 will have to be redone as ~~it~~ part of it was past the ~~check~~ checkpoint, so it was not fully committed.
 - iii. T2 completed successfully and was not affected. T2 aborted, but not affected by the failure. Both were transactions were before the checkpoint and are not affected.

4 ✓
24 ✓

Student Number: JS1030556

Time	T ₁	T ₂	bal _x (£500)	
t1		BEGIN TRANS	500	✓
t2	BEGIN TRANS	Read bal _x	500	✓
t3	Read bal _x	bal _x = bal _x + 100	600	✓
t4	bal _x = bal _x - 50	Write bal _x	600	✓
t5	...	COMMIT	600	✓
t6	Write bal _x		450	✓
t7	COMMIT		450	✓

Table 1: Table for Question 4c.ii.