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AS - Computer Science 9618
Sir Aaqib Khan
Paper - 1

Topic: P1- Chapter | 8

Worksheet - 2

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Class: As

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QUESTION # 1. By: Sir Aaqib Khan

May/June 2018 Paper - 12/9608 [Question No. 7] By: Sir Aaqib Khan

7 A social media website has a relational database, WEBDATA, that stores the site's information.

The database has three tables to store users' details, and details of the images and text that they post.

- USER(UserName, FirstName, SecondName, DateOfBirth)
- PHOTO(PhotoID, UserName, Comment, UploadDate)

TEXTPOST(PostID, UserName, DateOfPost, TheText)

(a) (i) Explain how the relationship between the tables USER and PHOTO has been implemented.

UserName is primary key in USER and foreign key in PHOTO.

[2]

(ii) Draw the entity-relationship (E-R) diagram to show the relationships between the three tables.



[2]

(b) A database administrator decides to enforce referential integrity.

Use an example from the database WEBDATA to explain what is meant by **referential integrity**.

If a record is deleted in primary table. All corresponding link record in foreign table are also deleted. The foreign keys must be the same data type as the corresponding primary key. Linked records in foreign Table will be modified if records in primary table are modified.

[3]

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(c) The database has been normalised to Third Normal Form (3NF).

Define the three stages of database normalisation.

1NF All attributes are atomic

2NF No partial dependencies

3NF No transitive dependency.

[3]

(d) The following shows sample data from the `USER` table.

UserName	FirstName	SecondName	DateOfBirth
gem123	John	Smith	01/01/1995
purpleSky	Muhammed	Ali	23/02/1956
OpenWindow	Sunny	Amir	03/03/1997
bluebird127	Raziya	Bello	04/03/1982

(i) Write an SQL script to create the `USER` table.

```
CREATE TABLE USER
(
USERNAME VarChar NOT NULL,
FirstName VarChar,
SecondName Varchar,
DateOfBirth Date,
PRIMARY KEY (UserName)
);
```

[5]

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(ii) The database administrator needs to alter the `USER` table. A new field, `Country`, needs to be added.

Write an SQL script to add the field `Country` to the `USER` table.

```
ALTER TABLE USER
ADD Country Varchar;
```

[2]

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QUESTION # 2. By: Sir Aaqib Khan

Oct/Nov 2019 Paper - 12/9608 [Question No. 4] By: Sir Aaqib Khan

4 Anushka needs to store information about bookings at a sports club.

(a) Anushka has a file-based storage system. She wants a relational database.

(i) Describe the features of a relational database that address the limitations of Anushka's file-based system.

Complex queries can be more easily written to search. Improves security as different users can be given different access rights. Allows concurrent access to data by the use of record locking. Multiple tables are linked together, reducing data redundancy.

[4]

(ii) The relational database design needs to be normalised. The following statements describe the three stages of database normalisation.

Complete the statements by filling in the missing words.

For a database to be in First Normal Form (1NF) there must be no ...repeating... groups of attributes.

For a database to be in Second Normal Form (2NF), it must be in 1NF, and contain no ...partial... key dependencies.

For a database to be in Third Normal Form (3NF), it must be in 2NF, and all attributes must be fully dependent on the ...primary... ...Key... .

[4]

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(b) The **normalised** relational database, SPORTS_CLUB, has the following table design.

MEMBER(MemberID, FirstName, LastName, MembershipType)

SESSION(SessionID, Description, SessionDate, SessionTime, NumberMembers)

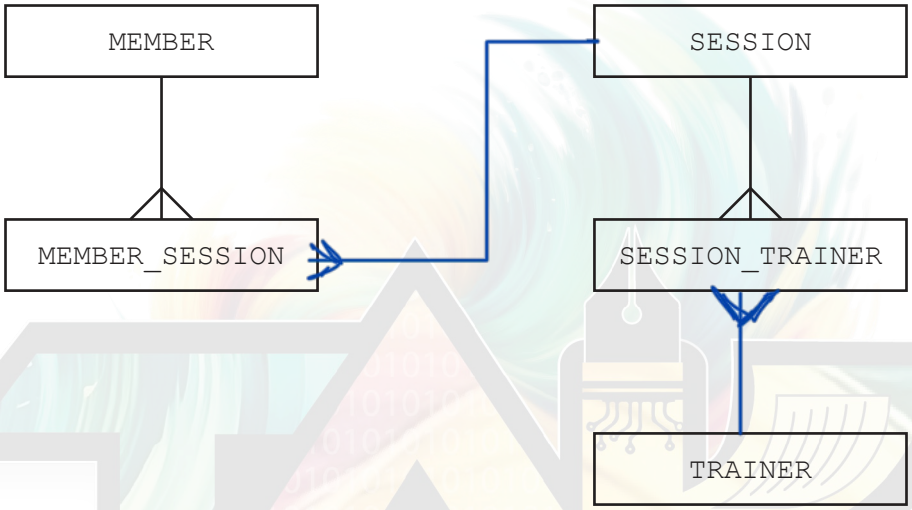
TRAINER(TrainerID, TrainerFirstName, TrainerLastName)

MEMBER_SESSION(MemberID, SessionID)

SESSION_TRAINER(SessionID, TrainerID)

(i) Anushka has designed an entity-relationship (E-R) diagram for SPORTS_CLUB.

Complete the entity-relationship (E-R) diagram.



[2]

(ii) Anushka first needs to create the database that she has designed.

Write a Data Definition Language (DDL) statement to create the SPORTS_CLUB database.

CREATE DATABASE SPORTS_CLUB;

[1]

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(iii) The table shows some sample data for the table `SESSION`.

SessionID	Description	SessionDate	SessionTime	NumberMembers
21PL	Pilates junior	04/04/2020	18:00	15
13AE	Aerobics senior	04/04/2020	19:00	20
33WG	Weightlifting advanced	04/04/2020	10:00	10

Write a DDL script to create the table `SESSION`.

```
CREATE TABLE SESSION
(
SessionID CHAR NOT NULL
Description VarChar,
SessionDate Date,
SessionTime Time,
NumberMembers Integer,
PRIMARY KEY (SessionID)
);
```

[5]

(iv) Write a Data Manipulation Language (DML) script to return the first name and last name of all members who have `Peak` membership type.

```
SELECT FirstName, LastName
FROM MEMBER
WHERE MembershipType = "Peak";
```

[3]

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QUESTION # 3 By: Sir Aaqib Khan

Oct/Nov 2020 Paper - 12/9608 [Question No. 5] By: Sir Aaqib Khan

5 A teacher uses a relational database, `RESULTS`, to store data about her students and their test results.

(a) Describe the benefits to the **teacher** of using a relational database instead of a file-based approach.

Reduced data redundancy as the teacher only needs to enter data once. Linked tables can be set up by teacher for her students and their result, linking them by common attributes. Teacher can prevent student access to the data so privacy is improved.

[4]

(b) The teacher sets up the `RESULTS` database using a Database Management System (DBMS).

(i) Explain the ways in which the developer interface of a DBMS will help the teacher set up the database.

Design a report for the output of student marks. Add a menu to select options for different actions.

[2]

(ii) The DBMS creates a data dictionary for the `RESULTS` database.

Identify **three** items that will be included in the data dictionary.

1 Data types

2 Primary keys.

3 Validation

[3]

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(c) The RESULTS database has the following structure:

STUDENT(StudentID, FirstName, LastName, Class, TargetGrade)

TEST(TestID, Topic, MaxMarks)

STUDENT_TEST(StudentID, TestID, Mark)

(i) Complete the following table by giving **one** example of each database term from the database RESULTS. Give both the field name and the corresponding table name.

Database term	Field name	Table name
Primary key	Student ID	STUDENT
Foreign key	TestID	STUDENT_TEST
Attribute	Any field from that table	Any table

[3]

(ii) Tick (✓) **one** box to identify whether the database RESULTS is in 1NF, 2NF or 3NF. Justify your choice.

1NF	2NF	3NF
		✓

Justification: There are no repeating groups of attributes. . There are no partial dependencies.

[3]

(iii) Complete the Data Manipulation Language (DML) script to display the Student ID, mark and maximum marks for all tests with the topic of 'Programming'.

```
SELECT StudentID, Mark, MaxMarks
FROM STUDENT_TEST, TEST
WHERE Topic = "Programming"
AND TEST.TestID = STUDENT_TEST.TestID;
```

[5]

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(iv) The teacher wants to implement validation to make sure that all data entered into the database RESULTS are reasonable.

Name **three** different methods of data validation that can be used in the RESULTS database. Describe how each method will limit the data that can be entered in this database.

Method 1 Range check

Description The mark for each test must be between 0 and max marks.

Method 2 Length check

Description Limit the target grade to 1 character

Method 3 Presence check

Description A mark must be entered.

[6]

(d) The teacher stores the database on the desktop computer in her classroom.

(i) Explain why it is important to keep the database secure.

To prevent students changing grades. Prevent loss of data.

[2]

(ii) Explain the ways in which the teacher can use data backup and disk mirroring to limit the amount of data lost in the event of hardware failure.

Data backup

A copy of RESULTS database is made daily. and stored in different location, So in the event of data loss, the original data may be recovered

Disk mirroring

Data is written to different disks simultaneously So, in the event of hardware failure, a second identical copy is immediately available

[4]

QUESTION # 4 By: Sir Aaqib Khan

May/June 2021 Paper - 12/9608 [Question No. 4] By: Sir Aaqib Khan

4 K2 Mountain Guiding is a company that runs courses teaching people how to climb mountains.

The company uses a file-based approach to store and retrieve data.

(a) Describe **three** drawbacks of a file-based approach compared to a relational database.

Drawback 1 It is not easy to perform complex searches, as new program has to be written each time.

Drawback 2 Lack of privacy as user views cannot easily be implemented

Drawback 3 There is data duplication because the same data is stored multiple times.

[6]

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(b) Each course has a destination and a trip date, and is run by a guide. Customers can book a place on one or more courses.

The following table shows part of the stored file:

Customer name	Customer date of birth	Guide	Destination	Trip date
Jay Patel	10/10/1976	Artem	Elbrus	06/03/2023
Paul Schloss	10/04/1999	Kenton	K2	01/03/2022
Mina Wang	03/03/2000	Kenton	K2	01/03/2022
Paul Schloss	10/04/1999	Safia	Mont Blanc	07/07/2024
Jay Patel	10/10/1976	Safia	K2	04/04/2023

The company has decided to create a relational database to replace the current file-based approach.

Identify **three** reasons why the data in this table is not in First Normal Form (1NF).

1 There is no unique primary key.

2 Customer name is not atomic

3 Customer name have repeated groups of attributes.

[3]

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(c) The table, GUIDE_TABLE, is created.

Each guide has a unique guide ID.

Part of the table GUIDE_TABLE is shown:

GuideID	Guide	DateOfBirth	Gender
1	Artem	07/03/1992	M
2	Kenton	08/04/1984	M
3	Safia	10/10/1999	F

Write a Data Definition Language (DDL) statement to define the table GUIDE_TABLE.

```
CREATE TABLE GUIDE_TABLE
(
GuideID INTEGER,
Guide VarChar,
DateOfBirth DATE,
PRIMARY KEY (GuideID)
);
```

[5]

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QUESTION # 5 By: Sir Aaqib Khan

Oct/Nov 2021 Paper - 12/9618 [Question No. 6] By: Sir Aaqib Khan

6 A shop sells plants to customers. The shop manager has a relational database to keep track of the sales.

The database, PLANTSALES, has the following structure:

PLANT(PlantName, QuantityInStock, Cost)

CUSTOMER(CustomerID, FirstName, LastName, Address, Email)

PURCHASE(PurchaseID, CustomerID)

PURCHASE_ITEM(PurchaseID, PlantName, Quantity)

(a) The database is normalised.

(i) The table lists the following three stages of normalisation:

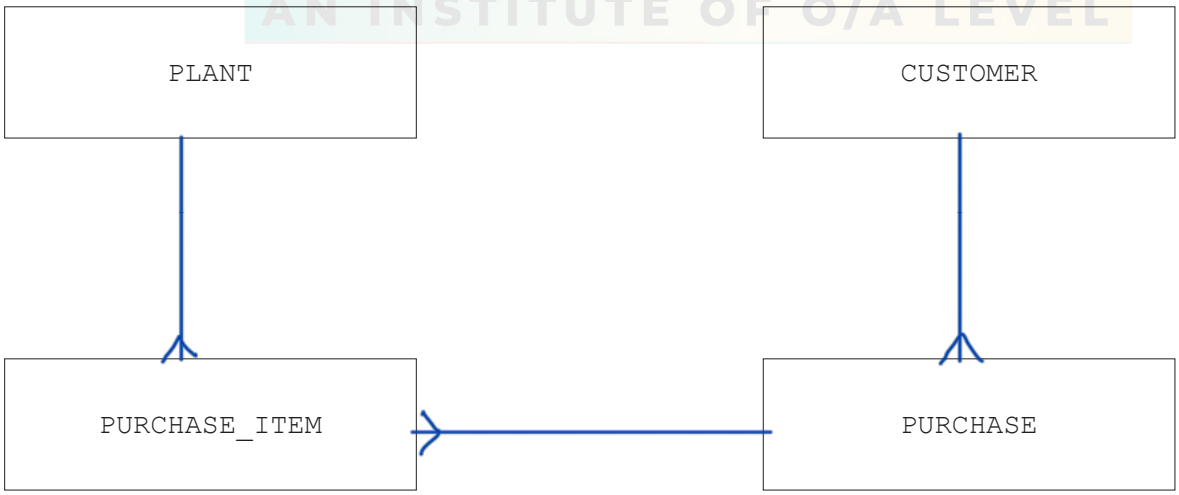
- The first stage is from a database that is not normalised (0NF) to First Normal Form (1NF).
- The second stage is from 1NF to Second Normal Form (2NF).
- The third stage is from 2NF to Third Normal Form (3NF).

Tick (✓) **one** box in each row to identify the appropriate stage for each task.

Task	Normalisation stage		
	0NF to 1NF	1NF to 2NF	2NF to 3NF
Remove any partial key dependencies		✓	
Remove any repeating groups of attributes	✓		
Remove any non-key dependencies			✓

[2]

(ii) Draw an entity-relationship (E-R) diagram for the database PLANTSALES.



[3]

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(b) The shop manager uses a Database Management System (DBMS).

Describe the purpose **and** contents of the data dictionary in the DBMS.

It stores meta data about the database. For example field and table name.

[3]

(c) The shop manager uses both Data Definition Language (DDL) and Data Manipulation Language (DML) statements to create and search the database.

(i) Complete the DML statements to return the total number of items purchased with the purchase ID of 3011A.

```
SELECT SUM(Quantity)
FROM PURCHASE_ITEM
WHERE purchaseID = "3011A";
```

[4]

(ii) Write DDL statements to include a field in the table `PURCHASE` to store the date of the order.

```
ALTER TABLE PURCHASE
ADD orderDate DATE;
```

[3]

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QUESTION # 6 By: Sir Aaqib Khan

May/June 2022 Paper - 13/9618 [Question No. 6] By: Sir Aaqib Khan

6 A relational database, TECHNOLOGY, stores data about the staff in a company and the computer devices used by the staff.

The database has the following tables:

STAFF(StaffID, FirstName, LastName, DateOfBirth, JobTitle)

DEVICE(DeviceID, Type, DatePurchased, StaffID)

(a) Describe the relationship between the two tables. Refer to the primary and foreign keys in your answer.

Primary Key StaffID in STAFF links to foreign Key StaffID in DEVICE. One staff member can have many device. Each device can only be be with one member of staff.

[4]

(b) The database uses a Data Definition Language (DDL) and Data Manipulation Language (DML).

(i) Complete the SQL script to return the number of devices stored in the database for the staff member with the first name 'Ali' and last name 'Khan'.

```
SELECT ..... (STAFF.StaffID)
FROM .....
INNER JOIN DEVICE
..... STAFF.StaffID = DEVICE.StaffID
WHERE STAFF.FirstName = 'Ali'
..... STAFF.LastName = 'Khan';
```

COUNT
STAFF
ON
AND

[4]

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(ii) The table `DEVICE` needs a new attribute to store whether the device has been returned by the staff member, or not.

Write a Structured Query Language (SQL) script to insert the new attribute into the table `DEVICE`.

ALTER TABLE DEVICE

ADD Returned BOOLEAN ;

[2]

(c) The database is in Third Normal Form (3NF).

Complete the table by describing the three normal forms.

Normal Form	Description
First Normal Form (1NF)	No repeating attributes
Second Normal Form (2NF)	No partial dependencies.
Third Normal Form (3NF)	No transitive dependencies.

[3]

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QUESTION # 7 By: Sir Aaqib Khan

May/June 2023 Paper - 11/9618 [Question No. 2] By: Sir Aaqib Khan

2 An organisation uses a database to store data about the types of bird that people have seen.

(a) The database is managed using a Database Management System (DBMS).

(i) State what is meant by a data dictionary **and** give **one** example of an item typically found in a data dictionary.

Definition ..... Data about the data in the database. .....

.....

Example ..... data types .....

.....

[2]

(ii) State what is meant by data integrity **and** give **one** example of how this is implemented in a database.

Definition ..... Methods of making sure the data is consistent .....

.....

Example ..... Validation .....

.....

[2]

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(b) The database, `Birds`, stores information about the types of bird and the people who have seen them.

Data about each bird seen is stored with its location and data about the person who saw the bird.

Database `Birds` has the following tables:

```
BIRD_TYPE(BirdID, Name, Size)

BIRD_SEEN(SeenID, BirdID, Date, Location, PersonID)

PERSON(PersonID, FirstName, LastName, EmailAddress)
```

(i) Complete the table by identifying **two** foreign keys and the database table where each is found.

Foreign key	Database table
Bird ID	BIRD_SEEN
PERSON ID	BIRD_SEEN

[2]

(ii) The database `Birds` has been normalised.

Draw **one** line from each Normal Form to the most appropriate definition.

Normal Form	Definition
First Normal Form (1NF)	There are no repeating groups of attributes.
Second Normal Form (2NF)	There are no partial dependencies.
Third Normal Form (3NF)	All fields are fully dependent on the primary key.

[1]

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(iii) Part of the database table `BIRD_TYPE` is shown:

BirdID	Name	Size
0123	Blackbird	Medium
0035	Jay	Large
0004	Raven	Large
0085	Robin	Small

The database only supports these data types:

- character
- varchar
- Boolean
- integer
- real
- date
- time

Write a Structured Query Language (SQL) script to define the table `Bird_Type`.

```
CREATE TABLE Bird_Type
(
BirdID INTEGER NOT NULL,
Name Varchar ,
Size Varchar ,
PRIMARY KEY (BirdID),
);
```

[4]

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(iv) The database tables are repeated here for reference:

```
BIRD_TYPE(BirdID, Name, Size)

BIRD_SEEN(SeenID, BirdID, Date, Location, PersonID)

PERSON(PersonID, FirstName, LastName, EmailAddress)
```

Complete the SQL script to return the number of birds of each size seen by the person with the ID of J_123.

```
SELECT BIRD_TYPE.Size, ..... (BIRD_TYPE.BirdID)
       AS NumberOfBirds
FROM BIRD_TYPE, .....
WHERE ..... = "J_123"
AND BIRD_TYPE.BirdID = .....
..... BIRD_TYPE.Size;
```

COUNT
BIRD_SEEN
BIRD_SEEN.PersoID
BIRD_SEEN.BirdID
GROUP BY

[5]

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