Databases

SAMPLE TIME CONSTRAINED ASSESSMENT
MARKING SCHEME

This marking scheme has been prepared as a **guide only** to markers. This is not a set of model answers, or the exclusive answers to the questions, and there will frequently be alternative responses which will provide a valid answer. Markers are advised that, unless a question specifies that an answer be provided in a particular form, then an answer that is correct (factually or in practical terms) **must** be given the available marks.

If there is doubt as to the correctness of an answer, the relevant NCC Education materials should be the first authority.

Throughout the marking, please credit any valid alternative point.

Where markers award half marks in any part of a question, they should ensure that the total mark recorded for the question is rounded up to a whole mark.

Answer ALL questions

Question 1

a) Explain TWO (2) functions of a DBMS, with an example and why this is important. **4**

Mark Scheme

Concurrency (1) ensures multiple users can use the database at the same time (1)
Security (1) Allows authorised users to gain access to relevant parts of the database (1) keep unauthorised users out of the database(1)
Backup and recovery (1) Ensures that the database can be recovered in the event of a failure (1)
Integrity (1)
Data descriptions (1) Describes the purpose of each field (1)
Stores data in linked tables (1) To avoid redundancy (1)

1 mark each point, valid alternatives accepted with 1 mark for explanation of why important max 2 points for each function and example max 4

b) Identify FOUR (4) types of records/entities a car sales showroom might store data about. **4**

Mark Scheme

Cars (1)/ Customer (1) / Staff (1) / Sales (1) / Customer Finance (1)
Any suitable alternative / Fields alone do not count / maximum 4 marks

c) If an ERD has a many-to-many relationship describe what could be done to fix it. **2**

Mark Scheme

break the many**-to-**many relationship **into two one-to-**many relationships **(1)**
create a third (join) table that has the primary keys of each of the new tables (1)

Total 10 Marks

Marks

Question 2

a) The following table is in *Third Normal Form* (3NF). Suggest appropriate data types and keys (if applicable) for the attributes listed. **6**

Attribute Name	Data Type	Key
ServiceID	Number (Auto increment)	Primary Key
CustomerID		
CarRegNo		
ServiceDate		
StaffID		

Mark Scheme

Attribute Name	***Data Type***	***Key***
ServiceID	***Number (Auto increment)***	***Primary Key***
CustomerID	***Number/Integer (1)***	***Foreign Key (1)***
CarRegNo	***VarChar (8)***	
ServiceDate	***Date/Time***	
StaffID	***Number/Integer (1)***	***Foreign Key (1)***

1 mark for each correct / appropriate data type used (character length is not required for the mark to be awarded). Customer and Staff IDs should be identified as a foreign key (1 mark for each one) Correct alternatives are to be marked, to a maximum of 6 marks.

b) Identify TWO (2) properties of a *Candidate key*. **2**

Mark Scheme

Any two of the following:

- ***It must contain unique values***
- ***May have multiple attributes***
- ***Must not contain null values***
- ***Should contain minimum fields to ensure uniqueness***
- ***Uniquely identify each record in a table.***

c) Explain the term *Optionality (in the context of an ERD)* and provide a suitable example. **2**

Mark Scheme

Specifies if entities on one side must be joined to an entity on the other side (1) any valid example (1)

Total 10 Marks

Marks

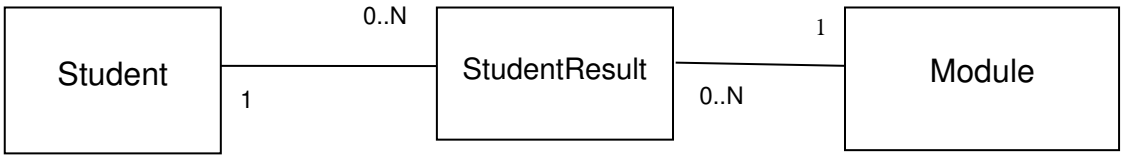
Question 3

Consider the following scenario shown below:

A college student studies a number of modules and is issued with a transcript of results at the end of the year.

a) Draw an *Entity-Relationship (ER) diagram* to represent the above scenario. **5**

Mark Scheme



- ***1 mark for each correct entity, to a maximum of 3 marks.***
- ***1 mark for each correct relationship, to a maximum of 2 marks (0.5 for each correct notation).***

b) Identify all of the primary **and** foreign keys for the ER model in question **3 a)**. **5**

Mark Scheme

Student:
StudentID (PK) – or any appropriate field name

Module:
ModuleID (PK)

Student Result (or suitable alternative):
StudentID (PK) (FK)
ModuleID (PK) (FK)

Or

ResultID (PK)
StudentID (FK)
ModuleID (FK)

- ***Award 1 mark for each (PK), to a maximum of 3 marks.***
- ***Award 1 mark for each (FK) – to a maximum of 2 marks.***
- ***Alternative naming allowed.***

Total 10 Marks

Marks

Question 4

a) Consider the ER diagram shown below for a Doctor's surgery system through which patients can book appointments with a Doctor. **6**

i) Create a CRUD matrix to show the following transactions:

Transaction 1 – add a new appointment for an existing patient
Transaction 2 – delete a Doctor
Transaction 3 – update a Patient's details
Transaction 4 – change the time of an appointment
Transaction 5 – produce a list of all appointments including Doctor & Patient details
Transaction 6 – add a new patient

Mark Scheme

Transaction	Doctor	Appointment	Patient
T1	R	C	R
T2	D		
T3			U
T4	R	U	R
T5	R	R	R
T6			C

1 mark for each correct row in a table, similar to the one shown above. Maximum 6 marks (award part marks for part correct solutions, round up final mark for question).

b) Identify the CRUD operations in a transaction. **4**

Mark Scheme

CREATE (1)
READ (1)
UPDATE (1)
DELETE (1)

Award any valid alternate explanatory point, to a maximum of 4 marks.

Total 10 Marks

Marks

Question 5

a) What does the acronym *SQL* stand for? **1**

Mark Scheme

Structured Query Language – award only one (1) point for full answer – no half points allowed.

b) Explain and summarise the purpose of *SQL.* **2**

Mark Scheme

SQL is a database language (1) that allows the database to be manipulated (1) or similar. Award 1 for a summary and 1 for the purpose, to a maximum of 2 marks.

c) Consider the following tables:

tblAnimal

AnimalID	**AnimalName**	**DOB**	**Type**
117	Leo	12/2/2017	Lion
218	Keeno	12/3/2015	Tiger
342	Darli	9/1/2012	Gorilla
912	Lou-Lou	18/7/2014	Elephant
1116	Doogle	25/4/2016	Elephant
1187	Prince	19/10/2015	Lion

tblKeeper

KeeperID	**KeeperName**
1	Cecil Armstrong
2	Miranda Narzala
3	Derek Longbottom
4	Hermoine Garnett

tblAnimalKeeper

KeeperID	**AnimalID**
1	117
1	1187
2	912
2	1116
3	218
4	342

Marks

i) Write the SQL that produces a list of the animals, type and date of birth in date order. **2**

Mark Scheme

Select * from tblAnimal (1 mark)
Orderby DOB (1 mark)
Alternative Select AnimalName, DOB, Type from tblAnimal (1 mark)

d) Write the SQL that lists only the names and dates of birth of the lions. **2**

Mark Scheme

Select AnimalName, DOB From tblAnimal (1 mark)
Where Type="Lion" (1 mark)

Alternative Select * from tblAnimal (1 mark)

e) Write the SQL that produces a list of all of the animal names, their type and their keeper names. **3**

Mark Scheme

Select AnimalName, Type, KeeperName From tblAnimal, tblKeeper (1 mark)
WHERE tblAnimal.AnimalID = tblAnimalKeeper.AnimalID (1 mark)
AND tblKeeper.KeeperID = tblAnimalKeeper.KeeperID (1 mark)

Total 10 Marks

Question 6

a) Consider the following table:

tblFood

FoodID	Description	Cost	Type
3	Chocolate Doughnut	£1.12	Sweet
4	Meat Pie	£0.89	Pies
5	Cheese Pie	£1.02	Pies
6	Danish Pastry	£1.05	Sweet

i) Write the SQL statement that will update the **Pies** type to **Savoury**. **3**

Mark Scheme

UPDATE tblFood (1 mark)
SET Type "Savoury" (1 mark)
WHERE Type = "Pies" (1 Mark)

Marks

b) Consider the following table:

tblItems

ItemID	ItemDescripton	Type	Price
3	White 6 Seat Dining Table	Table	£399.95
4	Small Oak Coffee Table	Table	£129.99
5	Small Children Wardrobe Pine	Bedroom	£124.99
6	Toddler Bed White	Bedroom	£89.99

i) Write the SQL statement that will delete all of the data held for items where the price is over £300. **2**

Mark Scheme

DELETE from tblItems (1 mark)
WHERE Price > 300 (1 mark)

c) Consider the following table:

tblCar

CarID	Manufacturer	Model	Price
1	Quintec	CityXP	£12,800
2	Smord	Sprint	£15,750
3	Nisax	Family	£21,995

i) Write the SQL statement that will create the table ***and*** add the data into the newly created table. **5**

Mark Scheme

CREATE TABLE tblCar(
CarID int NOT NULL AUTO_INCREMENT,
Manufacturer char (30),
Model char (20)
Price decimal (5,2)
PRIMARY KEY (CarID)
);
3 marks maximum, 1 mark correct syntax for create table, 1 mark for appropriate correct fields/data types (use discretion), 1 mark for primary key.
INSERT INTO tblCar (CarID, Manufacturer, Model, Price)
VALUES (1 mark for correct syntax)
('Quintec','CityXP',12800.00),
('Smord','Sprint',15750.00),
('Nisax','Family',21995.00)
(1 mark for correct data ensure consistency between fields created and data format / types)

Total 10 Marks

Marks

Question 7

Woof Cuts is a grooming salon for dogs. It has several groomers. The customer contacts the salon to make an appointment for their dog. The customer contact details are recorded on the system together with the name and breed of the dog (so that it can be determined if the dog is a small / medium or large breed – and can be charged accordingly). An appointment is made for the dog at an agreed date and time and a member of staff is assigned to that appointment. Special comments are noted on the appointment (e.g. Dog must be muzzled etc.)

A suggested ER model is below:

a) Replicate the *data dictionary* below for each one of the entities. **20**

Using the information provided above, populate it with a range of suitable attributes and associated meta data for each entity.

NB: For clarity it is expected that there will be multiple entries for each entity.

tblCustomer

AttributeName	Data Type	Length/Field Size	Key

tblAppointment

AttributeName	Data Type	Length/Field Size	Key

tblStaff

AttributeName	Data Type	Length/Field Size	Key

Marks

Mark Scheme

tblCustomer

AttributeName	*Data Type*	*Length/Field Size*	*Key*
CustomerID	*AutoNumber*		*Primary*
CustomerName	*String*	*25*	
ContactNo	*String*	*15*	
NameofDog	*String*	*20*	
Breedofdog/Size	*String*	*20*	

tblAppointment

AttributeName	*Data Type*	*Length/Field Size*	*Key*
AppointmentID	*AutoNumber*		*Primary*
CustomerID	*Number/Integer*		*Foreign Key*
StaffID	*Number/Integer*		*Foreign Key*
Price	*Double / currency*		
Comments	*String*	*50*	

tblStaff

AttributeName	*Data Type*	*Length/Field Size*	*Key*
StaffID	*Autonumber*		*Primary*
StaffFirstName	*String*	*20*	
StaffLastName	*String*	*25*	

Expectations and grading guidance:

KEYS: Would expect to see all relevant primary / foreign keys (maximum 5 marks)

Each appropriate attribute (0.5 marks to maximum of 6)
Each appropriate data type (0.5 marks to maximum of 6)
Each appropriate length/field size – use discretion; field sizes shown are just guidance (0.5 mark to maximum 3)

Total 20 Marks

Marks

Question 8

a) Explain the purpose of normalisation **2**

Mark Scheme

Reduce / eliminate data redundancy (1) create interlinking/related tables (1)

b) What conditions need to be met if a table is said to be in second normal form (2NF) **3**

Mark Scheme
Any of the following up to a maximum of 3 marks

Primary key contains only one attribute (1)
No non-key attributes exist in the relation (1)
In 1NF (1 mark) AND
Every non-key attribute is functional dependent on the full set of primary key attributes (1)

c) The following table is in first normal form (1NF) you should normalise it to second normal form **5**

Students		
FirstName	**Surname**	**Subject**
Adam	George	Art and Design
Melissa	Brown	Art and Design
Shabana	Atif	Maths
Louise	Jenkins	Maths

Mark Scheme

Students			
ID	**FirstName**	**Surname**	**Subject**
1	**Adam**	**George**	**1**
2	**Melissa**	**Brown**	**1**
3	**Shabana**	**Atif**	**2**
4	**Louise**	**Jenkins**	**2**

Subject	
ID	**Subject**
1	**Art and Design**
2	**Maths**

1 mark each for identification of each table (max 2)
1 Mark for each for each ID in each table (max 2)
1 mark for identification of subject ID in student table

Total 10 Marks

Marks

Question 9

a) Explain each of the following DBMS terms. **5**

i) *Tuple*

Mark Scheme

Tuple: is a row or a record in a table (1 mark)

ii) *Attribute*

Mark Scheme

Attribute: is a column / field / data item in a table (1 mark)

iii) *Data type*

Mark Scheme

A data type, is a type of data / it specifies which type of value an attribute has (1 mark)

iv) *Optionality*

Mark Scheme

Optionality: Specifies if entities on one side must be joined to an entity on the other side (1 mark)

v) *Cardinality*

Mark Scheme

Cardinality: Shows the type of relationship i.e. 1:M, M:1, M:M (1 mark)

b) Explain the term *referential integrity* and provide an example. **5**

Mark Scheme

Referential integrity refers to the accuracy (1) and consistency (1) of data within a relationship. In relationships, data is linked between two or more tables (1). ... Referential integrity requires that, whenever a foreign key value (1) is used it must reference a valid, existing primary key in the parent table. (1)
Alternative - 1 mark for each suitable point, to a maximum of 5.

Total 10 Marks

End of paper

Marks

Learning Outcomes matrix

Question	Learning Outcomes assessed	Marker can differentiate between varying levels of achievement
1	1,3	Yes
2	3,4	Yes
3	2,3	Yes
4	3	Yes
5	3	Yes
6	5	Yes
7	4,5	Yes
8	2,3	Yes
9	1,2,3,5	Yes

Grade descriptors

Learning Outcome	Pass	Merit	Distinction
Understand the concepts associated with database systems	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand the concepts associated with the relational model	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand how to design and develop a database system	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Be able to develop a logical database design	Show adequate development	Show sound and appropriate development	Show innovative and highly appropriate development
Be able to develop a database system using SQL	Show adequate development	Show sound and appropriate development	Show innovative and highly appropriate development