Ch11

Databases

CHAPTER ASSIGNMENT · 88 MARKS

Name _____ Class _____ No. _____ Date _____

Answer every question in the space given. Show your working. You may use the chapter page to help you.

Questions from *Computer Science for Cambridge International AS & A Level Coursebook*, 2nd edition, Sylvia Langfield and Dave Duddell (Cambridge University Press), for classroom use.

Tasks and questions from the chapter

Q11.01 **Question 11.01:** BandName is a primary key for the Band table. Does this mean that as a foreign key in the Member table it must have unique values? Explain your reasoning.

Q11.02 **Question 11.02:** If you are deciding on the cardinality of the relationship between two entities does it matter which one is put on the left and which on the right?

EQ11.01 **Extension Question 11.01:** Is it possible to annotate these relationships?

T11.01 **Task 11.01:** Consider the following scenario. An organisation books cruises for passengers. Each cruise visits a number of ports. Create a conceptual E–R diagram and convert it to a logical E–R diagram. Create a key table for the database that could be implemented from the design.

Q11.03 **Question 11.03:** In Step 2 of Worked Example 11.02, why is the Headlining attribute not placed in the Band table?

T11.02 **Task 11.02:** Normalise the data shown in Figure 11.11.

Order no: 07845				**Date:** 25-06-2016
Customer no: 056		**Customer name:**	CUP	
		Address:	Cambridge square	Cambridge
Sales rep no:	2	**Sales Rep name:**	Dylan Stoddart	

Product no	Description	Quantity	Price / unit	Total
327	Inkjet cartridges	24	$30	$720
563	Laser toner	5	$25	$125
		Total Price		$835

Figure 11.11 An order form

DP **Discussion Point:** How many of the above concepts are recognisable in your experience of using a database?

T11.03 **Task 11.03:** For the database defined in Worked Example 11.02, complete the DDL for creating the four tables. Use varchar(8) for BookingID, integer for NumberOfMembers, date for Date, character for Headlining and varchar(25) for all other data.

RP **Reflection Point:** Did you find normalisation difficult? It would be surprising if you didn't. Are you going to get as much practice as possible? There are many questions from previous exam papers that contain examples to try.

Exam-style questions

1 (a) A relational database has been created to store data about subjects that students are studying. The following is a selection of some data stored in one of the tables. The data represents the student's name, the personal tutor group, the personal tutor, the subject studied, the level of study and the subject teacher but there are some data missing:

StudentName	TutorGroup	Tutor	Subject	Level	SubjectTeacher
Xiangfei	3	MUB	Computing	A	DER
Xiangfei	3	MUB	Maths	A	BNN
Xiangfei	3	MUB	Physics	AS	DAB
Mahesh	2	BAR	History	AS	IJM
Mahesh	2	BAR	Geography	AS	CAB

(i) Define the terms used to describe the components in a relational database table using examples from this table. [2]

(ii) If this represented all of the data, it would have been impossible to create this table. Identify what has not been shown here and must have been defined to allow the creation as a relational database table? Explain your answer and suggest a solution to the problem. [4]

(iii) Is this table in first normal form (1NF)? Explain your reason. [2]

(b) It has been suggested that the database design could be improved. The design suggested contains the following two tables:

`Student(StudentName, TutorGroup, Tutor)`

`StudentSubject(StudentName, Subject, Level, SubjectTeacher)`

(i) Identify features of this design which are characteristic of a relational database. [3]

(ii) Explain why the use of StudentName here is a potential problem. [2]

(iii) Explain why the Student table is not in third normal form (3NF). [2]

2 Consider the following scenario: A company provides catering services for clients who need special-occasion, celebratory dinners. For each dinner, a number of dishes are to be offered. The dinner will be held at a venue. The company will provide staff to serve the meals at the venue. The company needs a database to store data related to this business activity.

(a) An entity–relationship model is to be created as the first step in a database design. Identify a list of entities. [4]

(b) Identify pairs of entities where there is a direct relationship between them. [4]

(c) For each pair of entities, draw the relationship and justify the choice of cardinality illustrated by the representation. [6]

3 Consider the following booking form used by a travel agency.

Booking Number 00453

Hotel: Esplanade
Colwyn Bay
North Wales

Rating: ***

Date	Room type	Number of rooms	Room rate
23/06/2016	Front-facing double	2	$80
23/06/2016	Rear-facing double	1	$65
24/06/2016	Front-facing double	2	$80

(a) Identify an unnormalised list of attributes using the data shown in this form. Make sure that you distinguish between the repeating and non-repeating attributes. [5]

(b) Demonstrate the conversion of the data to first normal form (1NF). The design of two tables should be defined with the keys identified. [3]

(c) Identify the appropriate table and demonstrate the conversion of the table to two tables in second normal form (2NF). Explain your choice of table to modify. Explain your identification of the keys for these two new tables. [5]

(d) Identify which part of your design is not in Third Normal Form (3NF). [2]

4 A small database is to be created with the following three tables:

`STUDENT(StudentID, StudentName, StudentOtherName, DateOfbirth)` (Note: `StudentID` is primary key)

`SUBJECT(SubjectName, SubjectTeacher)` (Note: `SubjectName` is primary key)

`TUTORIAL(StudentID(fk), Subjectname(fk), WeekNumber, Day, PeriodNumber)` (Note: `StudentID(fk), Subjectname(fk)` is composite primary key)

(a) Using the appropriate datatypes from `CHARACTER, VARCHAR, BOOLEAN, INTEGER, REAL, DATE`, write the SQL scripts to create two of the tables using the `CREATE TABLE` command. Do not at this stage identify any keys. [5]

(b) Assuming that all three tables have been created, write the SQL scripts to assign the primary key in the `SUBJECT` table and the two foreign keys in the `TUTORIAL` table. [3]

(c) Write the SQL script that will list all of the student names in age order. [5]

(d) There is an aspect of the design of the tables that could cause problems. Explain this problem. [2]

5 A school stores a large amount of data. This includes student attendance, qualification and contact details. The school's software uses a file-based approach to store this data.

(a) The school is considering changing to a DBMS.

(i) State what DBMS stands for. [1]

(ii) Describe **two** ways in which the Database Administrator (DBA) could use the DBMS software to ensure the security of the student data. [4]

(iii) A feature of the DBMS software is a query processor. Describe how the school secretary could use this software. [2]

(iv) The DBMS has replaced software that used a file-based approach with a relational database. Describe how using a relational database has overcome the previous problems associated with a file-based approach. [3]

(b) The database design has three tables to store the classes that students attend.

```
STUDENT (StudentID, FirstName, LastName, Year, TutorGroup)
CLASS (ClassID, Subject)
CLASS-GROUP (StudentID, ClassID)
```

Primary keys are not shown. There is a one-to-many relationship between `CLASS` and `CLASS-GROUP`.

(i) Describe how this relationship is implemented. [2]

(ii) Describe the relationship between `CLASS-GROUP` and `STUDENT`. [1]

(iii) Write an SQL script to display the `StudentID` and `FirstName` of all students who are in the tutor group 10B. Display the list in alphabetical order of `LastName`. [4]

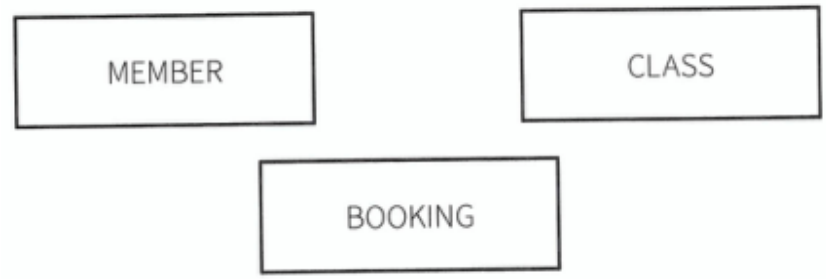
(iv) Write an SQL script to display the `LastName` of all students who attend the class whose `ClassID` is CS1. [4]

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6 A health club offers classes to its members. A member needs to book into each class in advance.

(a) The health club employs a programmer to update the class booking system. The programmer has to decide how to store the records. The choice is between using a relational database or a file-based approach. Give **three** reasons why the programmer should use a relational database. [6]

(b) The programmer decides to use three tables: `MEMBER`, `BOOKING` and `CLASS`. Complete the entity–relationship (E–R) diagram to show the relationships between these tables. [2]



(c) The `Class` table has primary key `ClassID` and stores the following data:

ClassID	Description	StartDate	ClassTime	NoOfSessions	Adultsonly
DAY01	Yoga beginners	12/01/2016	11:00	5	TRUE
EVE02	Yoga beginners	12/01/2016	19:00	5	FALSE
DAY16	Circuits	30/06/2016	10:30	4	FALSE

Write an SQL script to create the `CLASS` table. [6]

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End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/computer-science/as-a-level/databases/