Unit:
Database Design and Development

Assignment title:
Seasalter College

September 2018

Marking Scheme

Markers are advised that, unless a task 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.

This marking scheme has been prepared as a **guide only** to markers and there will frequently be many alternative responses which will provide a valid answer.

Each candidate's script must be fully annotated with the marker's comments (where applicable) and the marks allocated for each part of the tasks.

Throughout the marking, please credit any valid alternative point.

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

Marker's comments:

Moderator's comments:

Mark:	**Moderated mark:**	**Final mark:**

Penalties applied for academic malpractice:

Task	Guide	Maximum Marks
1	**a) Entity Model (20 marks).** **From 1 to 3 marks** There is little correct beyond a few of the entities. **From 4 to 8 marks** If choice of entities is correct (alternative names are acceptable) but most relationships are wrong then give 1 mark for each correct entity. Give additional marks for any correct relationships. **From 9 to 15 marks** If largely correct but still with some mistakes give 1 mark for each correct entity and relationship. **From 16 to 20 marks** Excellent solution that is correct in all but a few details such as cardinality of an otherwise correct relationship). **See Appendix 1 for suggested solution.** **b) Discussion of Normalisation (5 marks)** Up to 5 marks for discussion **See Appendix 2 for suggested answer.** **1 mark** There is very little beyond rudimentary understanding of process of normalisation **From 2 to 3 marks** The discussion shows an understanding of identification of each of the stages of normalisation up to 3rd normal form and how this has applied to scenario. **From 4 to 5 marks** There is full discussion with only trivial mistakes. There should be a clear indication of how the normalisation has identified the important relations in the system along the lines of that shown in appendix. **c) Data Dictionary (10 Marks)** The data dictionary should match the ER. It should clearly indicate Primary Keys and Foreign Keys.	

<table>
<tr><th>Task</th><th>Guide</th><th>Maximum Marks</th></tr>
<tr><td></td><td>Please Note: Marks should only be awarded here for entities that are correct. A data dictionary entry for an entity that is not correct (even if it matches the ER diagram) should NOT be awarded marks.

Award 1 mark for each correct entity with attibutes, PKs and FKs defined up to 10 marks.

See appendix 3 for suggesed data dictionary.</td><td>35</td></tr>
<tr><td>2</td><td>a) Create the tables in SQL and show the CREATE scripts as running in the programming environment. (4 marks)
b) Data on all the courses and teachers. Give a listing of this. (1 mark)
c) Data for modules and indicate who teachers them. Give a listing of this. (1 mark)
d) Data on all laboratories. Give a listing of this. (1 mark)
e) Data on the equipment found in the laboratories. Give a listing of this. (1 mark)
f) Write a query that selects all the teachers for chemistry courses. (3 marks)

<table>
<tr><th>Course Name</th><th>Staff ID</th><th>Staff Name</th></tr>
<tr><td>BTEC Level 3 Chemistry</td><td>S2399</td><td>Barry Harvey</td></tr>
<tr><td>BTEC Level 3 Chemistry</td><td>S2400</td><td>Dorinda Harvey</td></tr>
<tr><td>BTEC Level 3 Chemistry</td><td>S2111</td><td>Abidh Khan</td></tr>
</table>
g) Write a statement changing plant biology into a core unit. (3 marks)

h) Write a statement that changes the name of teacher ‘Mavis Kingdom’ to ‘Mavis Rickman-Kingdom’. (3 marks)

i) Write a query that shows all equipment in the chemistry laboratories. (3 marks)</td><td></td></tr>
</table>

Task	Guide	Maximum Marks

Course Code	Laboratory ID	Laboratory Name	Equipment ID	Equipment Name	Quantity	Equipment Type
CHEM	CHEM1	Chemistry One	SG	Safety goggles	21	Safety
CHEM	CHEM1	Chemistry One	BS	Beakers	50	Chemistry Experiment
CHEM	CHEM1	Chemistry One	CS	Conical flasks.	30	Chemistry Experiment
CHEM	CHEM1	Chemistry One	BF	Boiling flasks.	30	Chemistry Experiment
CHEM	CHEM1	Chemistry One	TT	Test tubes.	50	Chemistry Experiment
CHEM	CHEM2	Chemistry Two	SG	Safety goggles	21	Safety
CHEM	CHEM2	Chemistry Two	BS	Beakers	50	Chemistry Experiment
CHEM	CHEM2	Chemistry Two	CS	Conical flasks.	30	Chemistry Experiment
CHEM	CHEM2	Chemistry Two	BF	Boiling flasks.	30	Chemistry Experiment
CHEM	CHEM2	Chemistry Two	TT	Test tubes.	50	Chemistry Experiment

j) Write a query that shows all the teachers who might be using a microscope as part of their work. **(4 marks).**

S2399	Barry Harvey
S2300	Arabella Johnson
S2111	Abidh Khan

k) Write a query that produces the output that could be used to give details of the biology course, the modules that it is formed of and the teachers who teach those modules. **(4 marks).**

Course Code	Module Code	Module Name	Teacher
BIO	BC	Biochemistry of Life	Barry Harvey
BIO	PB	Plant Biology	Arabella Johnson
BIO	NEU	Neurochemistry	Barry Harvey
BIO	EP	Experimental Practice	Dorinda Harvey

l) Write a query showing how many types of item are classified as 'Chemistry Experiment'. **(4 marks).**

4 rows

Task	Guide	Maximum Marks
	Each query should be shown as an SQL statement running in a database environment. The full results set should also be shown. The query should use the given criteria: e.g. in query l) the key search term 'Chemistry Experiment' should be part of the query. For full marks the results should produce detail that are user-friendly and readable.	**32**
3	The discussion could include a written specification, table diagrams with attributes shown and/ or SQL. **Credit should be given to any valid approach.** Points that might be discussed include: adding columns, deriving, and using triggers. **Suggestions** for awarding marks: Up to 6 marks for generic discussion for example of use of aggregate functions of SQL without details of scenario. Up to 7 further marks for contextual details that includes: • Identification of tables and/or columns that will need to be used/altered • Specific use of aggregation • Any applications/triggers used. Model answer: To allow Seasalter College the capability of tracking and reporting on costs of cleaning and maintaining their laboratories it will be necessary to undertaken a number of modifications to the database. Firstly costs of cleaning will be discussed. In order to track income then the amount charged for cleaning laboratories will need to be included on the database. This could be added as a column to the laboratory table, using the alter table add column commands in SQL. This is assuming that each laboratory will be charged at a standard rate. If the staff who conduct the cleaning are to be recorded then one or more additional tables will need to be added depending on how these staff are modelled. For maintenance a similar approach will need to be taken and again the approach of an additional column on the laboratory table could deal with this. If a record of different maintenance over a period of time were needed then a separate table will be needed with details of maintenance and dates with links to a maintenance type table. This could also be linked to a staff table. Total amounts of income could be calculated using aggregate functions in SQL such as SUM. This could be used to tally amounts for each festival and stored as a summary column. Application software could be used to calculate total incomes across different festivals.	**13**

Task	Guide	Maximum Marks
4	General Points: Organisations of any success tend to get bigger and diversify (1 mark) It often happens that they will develop new sites both within the boundaries of one country and sometimes to other countries (globalisation). (1 mark for this or similar) This trend has been enhanced in the last century and even more so in recent decades by the use of technology that makes it easier to operate at a distance (from the telephone to the World Wide Web). (1 mark) Firms might also be involved in takeovers where they inherit databases from those firms they have taken over or merged with. (1 mark). With the increasing importance of database to any organisation they the need for distributed databases has grown alongside the trend in organisations being distributed. (1 mark) Alternative points should be credited. Suggestions for awarding marks: Up to 5 marks for general discussion as indicated. Up to 5 additional marks for points made about Seasalter College and/or the education sector.	**10**
5	This discussion should show an understanding of what the original requirements were (up to 3 marks.) A discussion of how the initial design attempted to meet them (up to 3 marks) and an overall assessment of how well the requirements have been met (up to 4 marks). A good format for this answer would be a table, with columns for identifying original requirements, one for design aspect and one for which aspects of the finished assignment have met these requirements, with assessment of this. Identifying original requirements (up to 3 marks). Only 1 mark should be given for simply stating that a database was required for holding the company's records. For full marks requirements should be specific e.g. relating to query e) The organisation required a listing of all stages, slots and artists. This will be useful for providing a listing for schedules for a festival. Discussion of how initial design attempted to meet them. Only 1 mark for simply stating that an ER model was produced. Higher marks for relating design to specific requirements. E.g. relating to query e) the design incorporated requirements for listing of customers by having an entity to hold this data. Assessment of how finished assignment met the requirements. Only 1-2 marks for simply stating that a database has been produced with associated queries. Higher marks for specific detailed discussion. E.g. with regard to query e) a query has been produced that list of stages, slots and artists. This shows the names of the artists and associated data in a readable format. Alternatively structured discussions should be credited.	**10**

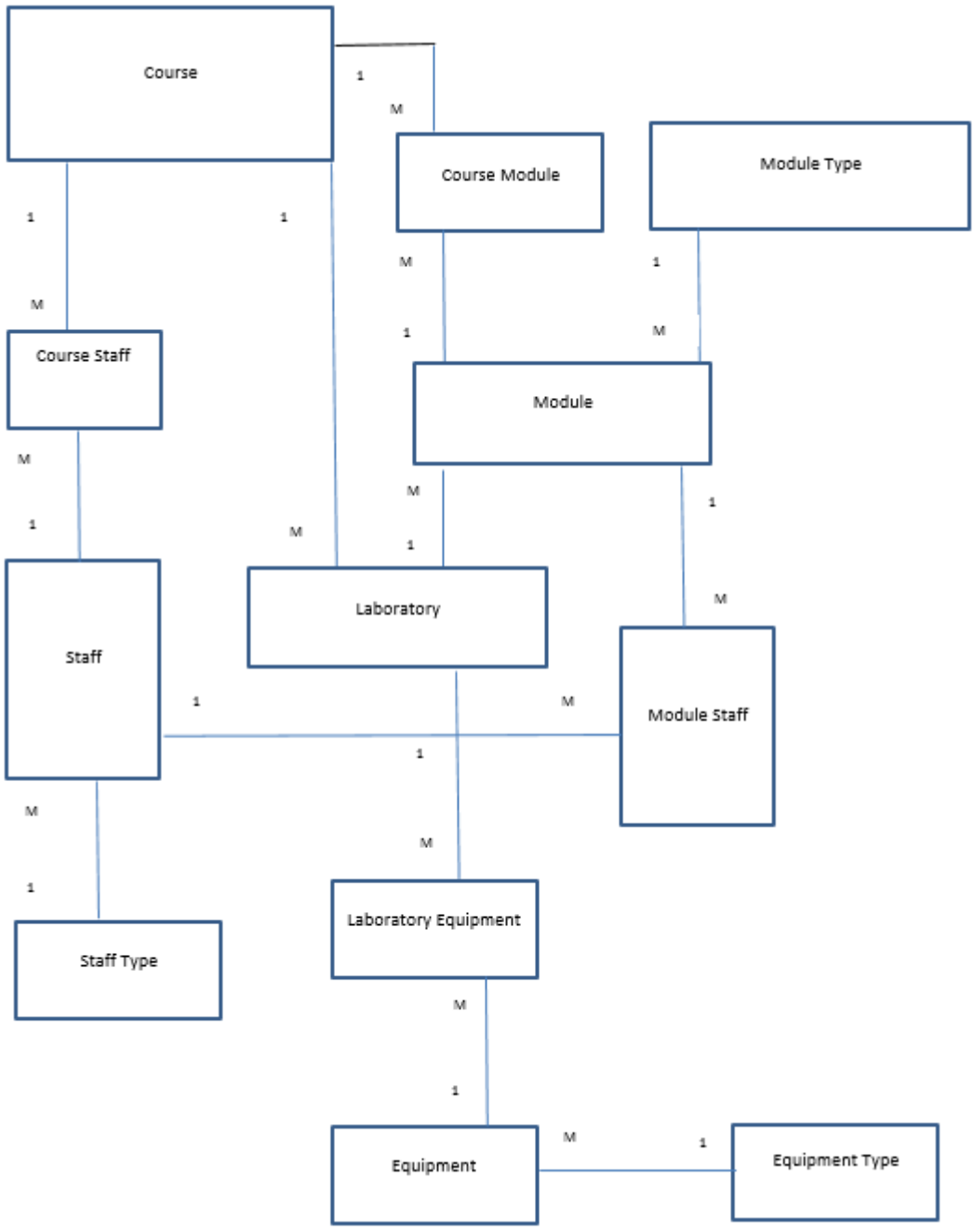
Task	Guide	Maximum Marks
	Model answers: Original requirements This table represents an overview of the original requirements of the scenario along with how those requirements have been met in both the design of the database and its implementation.	

Requirement	Design	Implementation
Course information	Entities: Course	Implemented database tables Query b) Data on all the courses and teachers. Query f) Write a query that selects all the teachers for chemistry courses.
Staff, staff allocated to courses	Entities:	Implemented database tables Query b) Data on all the courses and teachers. Query f) Data on the equipment found in the laboratories. Give a listing of this .
Courses and modules	Entities:	Implemented database tables Query c) Data for modules and indicate who teachers them
Laboratories	Entities: Laboratories	Implemented database tables

Task	Guide			Maximum Marks
			Query i)) Write a query that shows all equipment in the chemistry laboratories	
	Equipment	Entities: Equipment, Laboratory Equipment, Equipment Type	Implemented database tables Query i) Write a query that shows all equipment in the chemistry laboratories. Query j) Write a query that shows all the teachers who might be using a microscope as part of their work.	
				Total: 100 Marks

Appendix 1

Suggested ER Solution



Appendix 2

To gain full marks for this there should be overview of normalisation in general and discussion of how this has applied to the scenario. The answer does not need to show normalisation for all the example documents but could discuss aspects of any of them, or show one as an example for further detail. The suggested answer below is thus indicative.

How normalisation has informed the database design.

The normalisation process has identified some of the most important relations in the system. These are the courses, modules, teachers, laboratories and equipment. It indicates how these relate to one another and so shows how these should be modelled and implemented in the database. It has helped identify the primary keys of these core tables and the foreign keys.

Example of normalisation of Document 1

For example document one can be normalised into course/ course staff/ course. In 1NF the repeating group information for staff is separated from the course. In 2NF attributes that are functionally dependent on only part of a compound key are separated, in this case the staff information is separated from the attributes that link staff to the course. The attributes are already in 3NF for there are no non-key functional dependencies.

UNF	1NF	2NF	3NF
1 Course ID 1 Course Name	Course ID (PK) Course Name	Course ID (PK) Course Name	Course ID (PK) Course Name
2 Staff ID 2 Staff Name 2 Staff Type	Course ID (PK)(FK) Staff ID (PK) (FK) Staff Name Staff Type	Course ID (PK)(FK) Staff ID (PK) (FK) Staff ID (PK) Staff Name Staff Type	Course ID (PK)(FK) Staff ID (PK) (FK) Staff ID (PK) Staff Name Staff Type

Appendix 3. Suggested Data Dictionary for Task 1 c)

Attribute Name / Key	Data Type	Range/ Length	Constraints
Course			
Course Code (PK)	Char / Varchar	10	PK
Course Name	Char / Varchar	30	
Course Module			
Module Code (PK) (FK)	Char / Varchar	10	PK / FK
Course Code (PK) (FK)	Char/Varchar	10	PK / FK
Module			
Module Code (PK)	Char/Varchar	10	PK
Module Type Code (FK)	Char/Varchar	10	FK
Module Name	Char / Varchar	30	
Module Type			
Module Type Code(PK)	Char/Varchar	10	PK
Module Type Description	Char/Varchar	30	
Module Staff			
Module Code (PK) (FK)	Char / Varchar	10	PK / FK
Staff Code (PK) (FK)	Char / Varchar	10	PK / FK
Course Staff			
Course Code (PK)	Char / Varchar	10	PK / FK
Staff Code (PK) (FK)	Char / Varchar	10	PK / FK
Staff			
Staff Code (PK)	Char / Varchar	10	PK
Staff Name	Char/Varchar	30	
Staff Type			
Staff Type Code(PK)	Char/Varchar	10	PK

Staff Type Description		30	
Laboratory			
Laboratory Code (PK)	Char/Varchar	10	PK
Laboratory Name	Char/Varchar	30	
Laboratory Equipment			
Laboratory Code (PK) (FK)	Char/Varchar	10	PK
Equipment Code (PK) (FK)	Char/Varchar	10	PK
Equipment			
Equipment Code (PK)	Char/Varchar	10	PK
Equipment Name	Char/Varchar	30	
Equipment Type Code (FK)	Char/Varchar	10	FK
Equipment Type			
Equipment Type Code (PK)	Char/Varchar	10	PK/FK
Equipment Type Name	Char/Varchar	30	

Note: codes and descriptions have been supplied for 'Type' entities. Other ways of implementing this are acceptable.

Note: Datatypes and lengths can vary from those shown here.

Learning Outcomes matrix

Task	Learning Outcomes assessed	Marker can differentiate between varying levels of achievement
1	2	Yes
2	5	Yes
3	2	Yes
4	1	Yes

Grade descriptors

Learning Outcome	Pass	Merit	Distinction
Understand the enterprise application of database systems	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand how to enhance the design of and further develop a database system	Demonstrate ability to perform the task	Demonstrate ability to perform the task consistently well	Demonstrate ability to perform the task to the highest standard
Be able to enhance a logical database design	Demonstrate ability to perform the task	Demonstrate ability to perform the task consistently well	Demonstrate ability to perform the task to the highest standard
Be able to develop a physical database design	Show adequate development	Show sound and appropriate development	Show innovative and highly appropriate development
Be able to enhance a database system using SQL	Demonstrate ability to perform the task	Demonstrate ability to perform the task consistently well	Demonstrate ability to perform the task to the highest standard