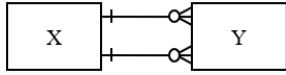
		<b>INTERNAL/ EXTERNAL</b>
		Sample
Unit Code and Title	CSG1207 Systems and Database Design	<b>SAMPLE EXAM</b>

<b>Duration</b>	<b>3 hours</b>
<b>Attempt</b>	Attempt ALL questions.
<b>Marks</b>	50 marks available, representing 50% of the unit mark.
<b>Type of Exam</b>	Closed Book Exam
<b>Special Instructions</b>	<ul style="list-style-type: none"> <li>• This exam paper <b>MUST</b> be handed in with your exam answer booklet(s).</li> <li>• Your answers must be written on the answer booklet(s) provided, <b>NOT</b> on the examination paper.</li> <li>• Assume SQL Server 2014 (or newer) when answering all SQL questions.</li> </ul>

**Do not commence reading or writing this examination until you are told to do so.**

## Section 1 – Multiple Choice

Attempt **ALL** of the questions in this section. Each question is worth **1** mark.  
**All answers (A, B, C or D) must be written on the answer booklet(s) provided.**  
Clearly indicate the question number of each of your answers.

- Q1)** A transitive dependency is...
- (A) A foreign key which does not relate to a primary key
  - (B) One or more attributes that only depend on part of the primary key
  - (C) A dependency between non-key attributes in a relation
  - (D) A dependency between attributes that only exists for certain values
- Q2)** Many-to-Many (M:M) relationships are resolved in logical ER diagrams...
- (A) Only if the intermediary entity contains meaningful attributes
  - (B) All the time
  - (C) None of the time
  - (D) Only if a meaningful name exists for the intermediary entity
- Q3)** Which foreign key attributes would be needed to implement the relationships between entities X and Y?
- 
- (A) Y needs one foreign key referencing the primary key of X
- (B) X needs two foreign keys referencing the primary key of Y
- (C) Y needs two foreign keys referencing the primary key of X
- (D) X needs a foreign key referencing the primary key of Y, and Y needs a foreign key referencing the primary key of X
- Q4)** Which of the following statements about self-referencing relationships is false?
- (A) Self-referencing relationships can be M:M in a logical diagram
  - (B) Self-referencing relationships are best implemented in object-oriented databases
  - (C) Both ends of a self-referencing relationship refer to the same entity
  - (D) Self-referencing relationships can have optional cardinality
- Q5)** Which of the following queries would select all rows and columns from a table named "staff"?
- (A) `SELECT ALL FROM staff;`
  - (B) `SELECT * FROM staff;`
  - (C) `SELECT * FROM staff WHERE *;`
  - (D) `SELECT ALL COLUMNS FROM staff;`

- Q6)** The largest value that a column with a data type of DECIMAL(4,2) could contain is...
- (A) 9999.99
  - (B) 99.99
  - (C) 99
  - (D) 9999
- Q7)** Which of the following names would match a LIKE search pattern of '\_a%[aeiou][^a-m]'?
- (A) Sarah
  - (B) Barney
  - (C) Jamie
  - (D) Martie
- Q8)** Which of the following WHERE clauses would return all rows where the "birthday" column is not NULL?
- (A) WHERE birthday = NOT NULL
  - (B) WHERE birthday != NULL
  - (C) WHERE NOT NULL(birthday)
  - (D) WHERE birthday IS NOT NULL
- Q9)** A table alias allows you to...
- (A) Create a duplicate table with a different name
  - (B) Automatically create aliases for all columns in a table
  - (C) Specify a name that can be used to refer to the table in that query
  - (D) Rename a table permanently
- Q10)** How do most aggregate functions treat NULLs?
- (A) They are counted as 0
  - (B) They are ignored
  - (C) They prevent a query from executing
  - (D) They cause the result of the function to be NULL
- Q11)** The CREATE INDEX command requires...
- (A) A table name and a column name
  - (B) An index name, a table name and a column name
  - (C) A table or view name and one or more column names
  - (D) An index name, a table or view name and one or more column names

## Section 2 – Short Answer

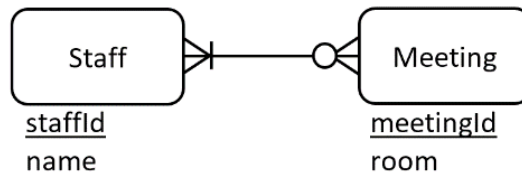
Attempt **ALL** of the questions in this section. Each question is worth **3** marks.

All answers must be written on the answer booklet(s) provided.

Clearly indicate the question number of each of your answers.

**Q12)** In your own words, describe the concepts of Insertion Anomalies, Update Anomalies and Deletion Anomalies.

**Q13)** In your own words, describe and illustrate the process of resolving a many-to-many relationship, using this diagram as a starting point:



**Q14)** In your own words, describe the similarities and differences between PRIMARY KEY and UNIQUE constraints.

**Q15)** Write a SELECT statement that adds 10% to a “salary” column in an “employee” table, and gives the resulting column an alias of “raised\_salary”. Order the results by the “salary” column, in descending order.

**Q16)** In your own words, describe the differences between a LEFT OUTER JOIN, a RIGHT OUTER JOIN and a FULL OUTER JOIN.

### Section 3 – Normalisation, ER Modelling and SQL

Attempt **ALL** of the questions in this section. Each question is worth **8** marks.

All answers must be written on the answer booklet(s) provided.

Clearly indicate the question number of each of your answers.

**Q17)** Normalise the following form to the third normal form (3NF), clearly showing the stages of 0NF, 1NF, 2NF and 3NF. Clearly state any assumptions you make about the data shown (e.g. derived fields), and name your final set of relations.

Use underlining to depict primary keys, and dotted underlining to depict foreign keys. Use both types of underlining on a single attribute if necessary.

<b>Tax Invoice</b>	<b>DOOM CO. LTD</b> <i>"#1 in Supervillain Supply!"</i>	<b>Tax Invoice</b>																																													
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**Q18)** You have been asked to create a database to keep track of the stock of a small bookstore. The business wants to record details of books, their authors and publishers, the categories of books, and book bundles they offer.

You have the following details:

- Details of books that need to be stored are the ISBN, title, edition number and the price.
- Details of book authors (their names and date of birth) must be stored. Each author can write multiple books, and each book can have multiple authors.
- The bookstore only wishes to store details of authors who have written books they sell.
- The name, contact phone number and address of book publishers must be stored. Each publisher can publish multiple books.
- The bookstore wishes to store details of all major publishers, even if the store does not currently sell any of their books.
- A list of book categories/topics must be stored. Each book can have multiple categories, and each category can apply to multiple books.
- Sometimes the bookstore offers book bundles, where they sell multiple books together for a discounted price. The database must store a name, description and price for each bundle.
- The database must record which books are in which bundles. A book can be in multiple bundles, and each bundle contains multiple books.

Create a suitable **physical Entity-Relationship diagram** based on this scenario. Ensure that you show all attributes mentioned, as well as the cardinality of all relationships. State any necessary assumptions.

It is recommended that you use auto-incrementing integers for primary keys, unless a suitable primary key attribute exists in the specified scenario.

Use underlining to depict primary keys, and dotted underlining to depict foreign keys. Use both types of underlining on a single attribute if necessary.

**Q19)** Write the SQL statements to achieve the objectives described below, based on the following data dictionary. You do NOT need to write a creation script.

“staff” table (stores details about staff members)				
Column Name	Data Type & Length	Null	Constraints	Other
staff_id	INT	NOT NULL	PK	IDENTITY
first_name	VARCHAR(25)	NOT NULL		
last_name	VARCHAR(25)	NOT NULL		
hire_date	DATE	NULL		
wage	MONEY	NOT NULL		
supervisor_id	INT	NULL	FK (staff.staff_id)	
store_id	SMALLINT	NULL	FK (store.store_id)	
job_id	TINYINT	NOT NULL	FK (job.job_id)	

“store” table (stores details about the stores in a chain of stores)				
Column Name	Data Type & Length	Null	Constraints	Other
store_id	SMALLINT	NOT NULL	PK	IDENTITY
store_name	VARCHAR(50)	NOT NULL		
address	TEXT	NOT NULL		
manager_id	INT	NOT NULL	FK (staff.staff_id)	

“job” table (stores details about the jobs held by staff members)				
Column Name	Data Type & Length	Null	Constraints	Other
job_id	TINYINT	NOT NULL	PK	IDENTITY
job_name	VARCHAR(50)	NOT NULL		
min_wage	MONEY	NOT NULL		DEFAULT 19.50
max_wage	MONEY	NULL		

- (A) Write a query which shows the full name (e.g. “Joe Bloggs”), job name and wage of all staff members who have a job name that starts with “sales”. Order the results by wage, in descending order. (3 marks)
- (B) Write a query which inserts a new row of data into the job table, specifying a job name of “Misc. Worker” and leaving the maximum wage NULL. Use the default value for the minimum wage column. (2 marks)
- (C) Create a view named “store\_details” which displays the name and address of all stores, as well as the full name (e.g. “Joe Bloggs”) of the store’s manager and the number of staff who work at the store. Make sure that all stores are included in the results, even if a store has no staff. (3 marks)

**END OF EXAMINATION PAPER**