COMP508 DATABASE SYSTEM DESIGN

SEMESTER 1, 2022

Database Project - Individual Assignment

Assignment Specification

Part	Tasks	Marks	Weight	Due date
Part A	Business rules and Conceptual ERD ➢ **Tasks 1, and 2**	Formative tasks – no marks		**5:00 pm, 11th April 2022**
Part B	Database Implementation ➢ **Tasks 3, 4, and 5**	65	50%	**5:00 pm, 7th June 2022**
Part C	Construct SQL Queries ➢ **Task 6**	25		**5:00 pm, 7th June 2022**
Total weight for the Database Project (Parts A, B, and C)			**50%**	

1.   Introduction to Assignment Requirements

This assignment is designed to provide students with practical exposure to the stages involved in database development including the development of entity relationship diagram, database design and implementation.

This is an individual assignment. It provides an opportunity for students to apply to a larger case study the database concepts discussed in class and practised in exercises.

The case study, described in detail, is provided on Canvas under Assessment -> Assignment - Database Project. Please read the **case study (available as a separate file)** carefully for more details. Students may ask for additional clarification of the case study on the discussion board on Canvas. The details of the tasks are specified in Section 2. Submission instructions are provided in Section 3. Feedback and marking scheme are provided in Section 4.

Tools & Templates

You are to use the specified **CASE tool**, **Visual Paradigm CE version** for this assignment.

Late Policy

Late assignments, without an approved extension, will be subject to a deduction of 5% (one grade e.g., from C+ to C) of the total mark available for each 24-hour period, or part thereof, up to a maximum of five calendar days. Assignments over five days late will not normally be accepted or marked and students will receive a DNC (Did Not Complete) for that assessment.

Plagiarism

Plagiarism means borrowing from the work of another without indicating by referencing (and by quotation marks where exact phrases are borrowed) that the ideas expressed are not one's own. Students may use the ideas and information of other authors, but this use must be acknowledged. It is not acceptable to submit an assignment that is simply paraphrasing of extracts from other authors: the work submitted must include some intellectual contribution of the student.

Unauthorised Collaboration

Unauthorised collaboration means joint effort between students or students and others, in preparing material submitted for assessment, except where this has been pre-approved by the programme. Students are encouraged to discuss matters covered in classes, but the expression of ideas and arguments must be the student's own work.

Section 2:

Part A Tasks: Business Rules and Conceptual Database Design

Due: 11ᵗʰ April 2022, 5:00 pm.

On 12ᵗʰ April 2022, feedback on Part A will be discussed during the lecture session and partial model answers for Part A, Task 1: Business rules, will be posted to Canvas. The logical model for Part B must be derived from the model answer of the Business rules posted on Canvas.

Note: You must complete the formative tasks in Part A before you do Parts B and C of the assignment.

Task 1 (Formative)   Identify Entities & Develop Business Rules

Identify all entities and relationships in the case study and develop a set of **business rules**. You should follow the syntax given below. Each relationship must be described by two rules, one in each direction.

Each/A/An ENTITY_1 *May/Must* Relationship_Verb_Phrase *number* ENTITY_2

Task 2 (Formative)   Construct a Conceptual Entity Relationship Diagram (ERD)

Based on the business rules developed in Task 1, construct a conceptual ERD for the case study. The diagram must include

- all entities identified in task 1
- all attributes in each entity including all keys (where applicable), composite, derived, and multi-valued attributes.
- the Cardinality and Participation for each relationship (e.g., 1:M, M:N).

Part B Database Implementation (Tasks 3, 4, and 5)   (50 marks)

Task 3 Construct a logical ERD [30 marks]

(1)   Based on the model answers for the business rules for the conceptual model (posted on Canvas), construct a logical Entity Relationship Diagram (ERD). Apply the mapping rules (Reference: Weeks 6 and 7 course material on logical database design and mapping rules for transforming ER diagrams to relations) to transform your conceptual ERD (developed in Part A, Task 2) to a logical ERD.

Your ERD must

- (a) Include entities which are in third normal form (3NF).
- (b) Identify and include the necessary attributes for each entity.
- (c) Ensure that all primary and foreign keys are clearly indicated.
- (d) Name all relationships using verb phrases in both directions, except where they are adjacent to bridging entities (used in resolving many-to-many relationships), in which case only the verb phrases related to the bounding entities need to be shown.
- (e) Identify Cardinality and Participation for each relationship. They must be consistent with the model answers provided for the business rules.
- (f) Be developed using **Visual Paradigm (VP).** Note: No need to include datatypes for attributes in your VP ERD.

Task 4 Create tables [20 marks]

Create the tables in Oracle using SQL Developer. Write SQL scripts defining each table. The table definitions should include

- All attributes with appropriate data types. Each attribute must have an Oracle datatype of appropriate type and size assigned to it.
- All appropriate constraints such as primary key, foreign keys, and check statements. All constraints **must** be given names. Naming standards must be used.

Task 5 Populate data [15 marks]

- Insert a small sample of realistic test data (5 rows minimum) into each table. All test data must be meaningful to demonstrate your understanding of the data.

For Part B, you must include the following for each table in your database:
- SQL table creation script
- SQL insert script
- Sample data (include results of SELECT statements for each table)

Part C Construct SQL Queries   (25 marks)

Task 6 Construct SQL Queries [25 marks]

Identify **ten** data retrieval and transaction requirements that would be used by the business described in the case study. For each of the requirements that you have identified, construct **SQL** queries needed to display the data. The queries must include a combination of the following SQL features:

- Use of restriction (WHERE clause), Arithmetic expressions, Concatenation of columns
- Use of comparison and logical operators
- Sorting output rows
- Multiple-table joins (e.g. Equijoin, Self-join and Outer join)
- Single row and multiple row functions

You can combine some of the preceding list of features in a single query. The design of each query should demonstrate your understanding of the correct usage of the various features and clauses of SQL.   A simple '**select * from table_name**' will fetch you a mark of zero. There should be **no** more than two queries that involve a single table.

For Part C, you must include the following for each SQL query statement -see example on next page:

- ▪ Description of the purpose of the query.
- ▪ SQL SELECT query
- ▪ The result of the query.

Example for Part C task 6: An **example** of a query from an employee database is given below for your reference

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- **Purpose of the query:**

To search for staff with a specific qualification (e.g. BSc) and retrieve the following details (Staff Number, Staff Name (Concatenation of Last and First names) and their Qualification.

- **SQL SELECT query**

```
SELECT
        staff.staff_no, staff_fname|| ' ' || staff_lname "Staff Name", qual_type
Qualification
FROM
        staff, qualification
WHERE
        qual_type = '&Qualification'
AND
        staff.staff_no = qualification.staff_no;
```

- **Output/Result of the query**

Input for Qualification type variable = "BSC"

Staff No	Staff Name	Qualification
101	John Smith	BSc
212	Mike Bird	BSc
112	Susan Carr	BSc
117	David Cameron	BSc

2.   Submission Instructions

You must submit a soft copy of your assignment on Canvas before the specified due date and time.

Parts B and C: Due Tuesday, 7th June, 5:00 pm

1. **Submit** a ZIP file which includes the following files using the link provided on Canvas. Multiple submissions are allowed. The last submission you make before the assignment deadline will be the one that we mark:

   - **DCT's Individual Assignment Cover Sheet** (available on Canvas). Please also make sure you write your lab session day and time correctly.
   - A **PDF** or **Word file** containing your work for all the Tasks in Parts B and C. A JPG/PNG image should be used when capturing your ERD diagram from Visual Paradigm. Use appropriate formatting options (e.g., clear background, large fonts) so that the diagram is clear and readable.
   - A **Visual Paradigm file** containing the ERD for Part B, Task 3.

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3.   Marking Scheme and Feedback

Feedback on Part A: On 12th April 2022, feedback on Part A will be discussed during the lecture session and partial model answers for Part A, Task 1: Business rules, will be posted to Canvas. The logical model for Part B must be derived from the model answer of the Business rules posted on Canvas.

Formative Tasks	Part A - Business Rules and Conceptual ERD
Part A, Task 1	**Identify Entities & Develop Business Rules** • Covers all essential entities and relationships in the case study • Develop a set of business rules using correct syntax
Part A, Task 2	**Construct a Conceptual Entity Relationship Diagram** • all entities identified in Part A, task 1 • all attributes in each entity including all keys (where applicable), composite, derived, and multi-valued attributes. • the Cardinality and Participation for each relationship (e.g. 1:M, M:N).
Part A tasks do not have any marks. However, they must be completed before you start Part B. You cannot do Part B without completing Part A.	

Part B Tasks	Marking Criteria	Max Mark
	Part B Database Implementation	
Part B – Task 3	**Construct logical ERD** • All entities are in third normal form (3NF) – [5 marks] • All essential attributes identified for each entity – [5 marks] • Cardinality and Participation for each relationship correctly identified and consistent with the model answers provided for the business rules – [5 marks] • All primary and foreign keys are correctly identified and clearly indicated – [5 marks] • Relationships are named using verb phrases in both directions, except where they are adjacent to bridging entities (used in resolving many-to-many relationships), in which case only the verb phrases related to the bounding entities need to be shown – [3 marks] • ERD developed using Visual Paradigm (VP) – [4 marks] • It is clear and readable – [3 marks]	30
Part B – Task 4	**Oracle Table Creation Scripts for all tables in the database** • Tables created are consistent with logical ERD – [4 marks] • All attributes have appropriate Oracle data types and size – [6 marks]. • All constraints such as primary key, foreign keys, and check statements are correctly implemented – [7 marks] • Constraints are named using consistent naming notation – [3 marks].	20
Part B – Task 5	**Oracle Insert Scripts for populating the tables in your database:** • Insert statements for all tables in the ERD – [5 marks] • Data is realistic and relates to the case study - [5 marks] • the results of SELECT statements showing the data inserted into tables (i.e., includes SELECT * FROM *table_name* for each table) – [5 marks]	15
Part B Total		**65**

Part C Construct SQL Queries		

Part C - Task 6	**Construct ten SQL Queries:**
	
	Each query
	• Retrieves meaningful information to support the data and transaction requirements of the case study -[5 marks]
	• includes description of the purpose of the query – [5 marks]
	• Demonstrates knowledge and application of SQL content covered in the course (covers important SQL features, clauses, and functions). They must include the following: [10 marks]
	    a. Use of restriction (WHERE clause), Arithmetic expressions, Concatenation of columns
	    b. Use of comparison and logical operators
	    c. Sorting output rows
	    d. Joins (e.g. Equijoin, Self-join and Outer join)
	    e. Single row and multiple row functions
	• includes results (output rows) – [5 marks]
		25

Part C Total		**25**
Total of Parts B and C		**90**