UNIVERSITY OF WESTMINSTER

Computer Science & Software Engineering

5COSC020W DATABASE SYSTEMS COURSEWORK (2022/2023)	
Module leader	Ragu Sivaraman
Unit	Database Systems Coursework – INDIVIDUAL COURSEWORK
Weighting:	60%
Qualifying mark	30%
Description	Produce a conceptual data model & a logical data model following given specs. Write SQL statements to complete specific tasks. Produce a supporting report.
Learning Outcomes Covered in this Assignment:	LO1 Design a robust relational database schema using UML notations; LO2 Produce robust SQL statements to create logically connected database tables and populate them; LO3 Produce solid SQL queries to retrieve, aggregate, update and delete data from one or multiple database tables; LO5 Critically evaluate the needs for non-relational databases e.g. No-SQL databases and XML Databases.
Handed Out:	27 September 2022.
DUE DATES	**31 OCTOBER 2022 at 13:00:00 – Part A.** **28 NOVEMBER 2022 at 13:00:00 – Part A + Part B.**
DELIVERABLES	**> MON 31 OCTOBER 2022 at 13:00:00 – Intermediary Report: Part** ***One report in PDF format, font Calibri size 11.*** • 1 cover page for part A, student details & tutorial group. • 1 side featuring conceptual EERD. • 4 data dictionary tables supporting conceptual EERD. **> MON 28 NOVEMBER 2022 at 13:00:00 – FINAL REPORT: Part A + Part** ***One report in PDF format, font Calibri size 11.*** • 1 cover page for part A+B, student details & tutorial group. • 1 side featuring conceptual EERD. • 4 Data Dictionary tables supporting conceptual EERD. • 1 side featuring mapped logical ERD. • 1 SQL query to retrieve data from specific database tables. • 1 Comparative Analysis Table.
SUBMISSION	Online in **'ASSESSMENT - Coursework (CWK)'** section on Blackboard.
Type of Feedback and Due Date:	PART A: global formative feedback on conceptual EERD. PART A + B: online feedback and marks using Blackboard Rubrics, 15 working days (3 weeks) after the submission deadline. All marks provisional until formally agreed by Assessment Board.
BCS Accreditation Criteria	2.1.1 Knowledge and understanding of facts, concepts, principles & theories 2.1.2 Use of such knowledge in modelling and design 2.2.1 Specify, design or construct computer-based systems 2.3.2 Development of general transferable skills 3.1.3 Knowledge of systems architecture 3.2.1 Specify, deploy, verify and maintain information systems

Assessment regulations

For detailed information regarding University Assessment Regulations on how you are assessed, penalties and late submissions, what constitutes plagiarism etc. please refer to the following website: http://www.westminster.ac.uk/study/current-students/resources/academic-regulations

Penalty for Late Submission

If you submit your coursework late but within 24 hours or one working day of the specified deadline, 10 marks will be deducted from the final mark, as a penalty for late submission, except for work which obtains a mark in the range 40 – 49%, in which case the mark will be capped at the pass mark (40%). If you submit your coursework more than 24 hours or more than one working day after the specified deadline you will be given a mark of zero for the work in question unless a claim of Mitigating Circumstances has been submitted and accepted as valid.

It is recognised that on occasion, illness or a personal crisis can mean that you fail to submit a piece of work on time. In such cases you must inform the Campus Office in writing on a mitigating circumstances form, giving the reason for your late or non-submission. You must provide relevant documentary evidence with the form. This information will be reported to the relevant Assessment Board that will decide whether the mark of zero shall stand. For more detailed information regarding University Assessment Regulations, please refer to the following website:

http://www.westminster.ac.uk/study/current-students/resources/academic-regulations

Coursework Part A: Conceptual EERD [40 Marks]

Part A Project Brief: Tourmato

Tourmato is a touristic company that offers exciting "off-the-beaten track" visiting tours around several cities across Europe. Essentially, Tourmato takes groups of customers around European cities to get them to see them and experience their unique atmospheres, under the direction of a local experienced tour guide.

Each city covered by Tourmato contains multiple touristic attractions considered worth visiting. These attractions fall under two categories: touristic landmarks and restaurants. Landmarks are simply relevant locations in the city that can be viewed, such as monuments, buildings, statues, squares, streets, parks, places of worship and so many more. Restaurants, on the other hand, offer interesting typical foods (dishes and/or drinks) to be sampled so that to allow people to experience the local culinary delicacies.

To provide a range of experiences, every city covered by Tourmato offers many visiting tours. Importantly, the same tour can be scheduled and run multiple times and slightly customised every time. When a tour is actually scheduled on a particular day, it is referred to as a "tour session". Essentially, a tour session is a visiting tour that has been assigned a specific start date and time, a start address, an end date and time and an end address. Every tour session is also given a tailored price and a maximum number of customers that it can accommodate. A given tour session is naturally associated to a selected list of attractions to be visited (a minimum of 8 for every tour session) and is allocated to a specific tour guide to lead the tour session.

Tourmato customers can place a booking for a variety of exciting tour sessions, depending on what they like. In fact, there are three different types of tour sessions (all led by a tour guide): walking tour sessions, cycling tour sessions and food tour sessions. Walking tour sessions are conducted on foot: customers visit the city by walking from one attraction to another. On cycling tour sessions, customers ride from one attraction to another on a bicycle. Finally, food tour sessions allow customers to stop at different restaurants and sample selected foods i.e., several dishes and/or drinks. It is possible for a walking tour session or a cycling tour session to also be a food tour session: in this case, customers will walk or ride between different attractions, see selected landmarks and stop at different restaurants to taste some of the nice foods on offer. Naturally, a cycling session requires the use of equipment that need to be provided by Tourmato. Tourmato lends two main types of equipment for cycling tour sessions: bicycles and cycle helmets. Bicycles come in several styles and sizes, while helmets also have different sizes.

In terms of staffing, Tourmato relies on highly-trained employees with specialised roles. The job of tour guides is naturally to lead the tour sessions: they take the customers around the city, stop at every attraction, and enthusiastically narrate key facts on the history, geography, architecture, ecology, or gastronomy for each visited attraction. Support staff also play a key role by ensuring the strict maintenance of all equipment used by Tourmato. Each member of the support staff is assigned the responsibility of several pieces of equipment to ensure that they are always kept in great condition. This is obviously a top priority for the company so that to guarantee the best experience and the highest safety of all paying customers placing bookings for exciting tour sessions with Tourmato.

Part A Questions

You have been hired by Tourmato as a **Database Architect** to undertake a database project to support the data needs of the company. Your job in this first part is to produce a high-quality **CONCEPTUAL ENHANCED ENTITY RELATIONSHIP DIAGRAM (EERD)** and to produce a **Data Dictionary** to document and support your model.

Prefix the names of all entities and attributes with your student id number starting with w (see end of doc).

QUESTION 1

Produce a complete **CONCEPTUAL EERD** for Tourmato.

This **CONCEPTUAL EERD** needs to include all the **entities**, **specialisations, relationships**, **multiplicities**, **attributes,** and **primary keys** that you have identified. It should be easy to read and needs to fit on one page of the report.

QUESTION 2

Create a **Data Dictionary** to document how you identified the **entities** and **specialisations** for Tourmato. To achieve this, fill in the 2 tables below to summarise and briefly explain the meaning of each entity.

Entity name	*Brief Description*

General entity	*Specialised entity*	*Brief explanation*

For more information, please refer to page 510 of the 6th edition of the Connolly's textbook.

QUESTION 3

Create a **Data Dictionary** to document how you identified the **relationships** and **multiplicities** for Tourmato. To achieve this, fill in the table below to summarise and justify the multiplicities for each relationship.

Entity name	*Multiplicity*	*Relationship*	*Multiplicity*	*Entity name*	*Brief justifications for the multiplicity (4 statements for each relationship)*

For more information, please refer to page 513 of the 6th edition of the Connolly's textbook.

QUESTION 4

Create a **Data Dictionary** to document how you identified the **attributes** and **primary keys** for each entity for Tourmato. To achieve this, fill in the table below to summarise and explain the meaning of each attribute and primary key.

Entity name	*Attributes for this entity (include PK)*	*Brief explanation*

For more information, please refer to page 516 of the 6th edition of the Connolly's textbook.

Interactive Q&A

To provide you with the support you may require as a Database Architect and answer any questions you may have about the Tourmato brief, an interactive Q&A is offered. This allows you to ask specific targeted questions to the Tourmato Managing Directors about the Tourmato business so that to improve and refine your conceptual EERD and for these questions and their answers to be shared with the entire class. The interactive Q&A is available as a discussion board on the module site on Blackboard.

Part A Marks Allocation

Part A will be marked based on the following marking criteria:

Marking Criteria	Marks
Clarity, formatting, and structure of the conceptual EERD with correct UML notations	06
Correct identification of entities + data dictionary tables	09
Correct identification of specialisations	10
Correct identification of relationships & multiplicities + data dictionary tables	09
Correct identification of attributes and primary keys + table	06
PART A TOTAL	**40**

Part B Project Brief: BoilHeater

BoilHeater is a home services provider based in the UK. It is specialised in the ongoing maintenance, regular servicing and repairing of central heating systems in properties around the country. Customers can subscribe to a BoilHeater contract to cover their properties. If a maintenance contract is signed, then BoilHeater guarantees the servicing of the central heating installation at regular intervals, as well as repairs in case of breakdowns. Additional costs might be incurred for the purchasing of spare parts for repairs.

The conceptual ERD for BoilHeater is given on Figure 1.

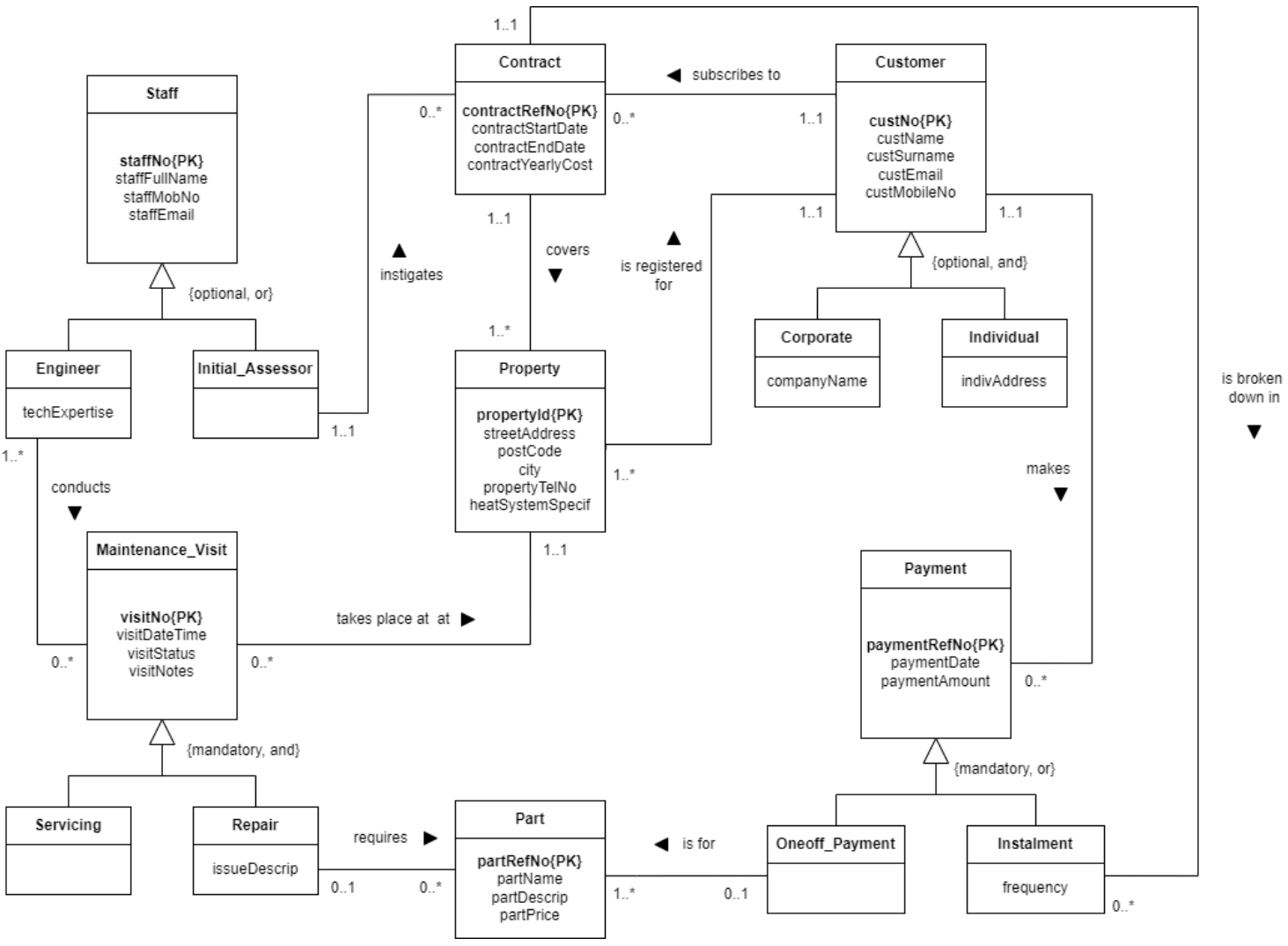


Figure 1. Conceptual EERD for BoilHeater

Part B Questions

You have been hired by BoilHeater as a **Database Consultant** to undertake a database project to support the data needs of the firm. In this second part, you are given a conceptual data model for BoilHeater (figure 1), and your first goal is to **map it** onto a high-quality **LOGICAL ENTITY RELATIONALHIP DIAGRAM (ERD)** to logically represent how the key business data needs can be organised as a set of interrelated tables that can then be implemented. These tables need to be interconnected according to the strict rules of the relational model to be implementable. You also have to write a key **SQL query** to retrieve specific data. Finally, you need to present a brief comparative analysis of **a specific relational database vs. a specific NoSQL database** with the aim to provide BoilHeater with informed guidance on which one may be the best option for them.

Prefix the names of all tables and attributes with your student id number starting with w (see end of doc).

QUESTION 5
Map the Conceptual EERD given on **figure 1** to produce a complete **LOGICAL ERD** for BoilHeater.
This **LOGICAL ERD** needs to include all the **correct tables, relationships, multiplicity constraints, attributes, primary keys** and **foreign keys**. It should be easy to read and needs to fit on one page of the report.

QUESTION 6
Based on your logical ERD for BoilHeater, write an **SQL query** to retrieve a list of customer surnames and emails along with the reference numbers, dates and amounts of the one-off payments they made. The list should be restricted as follows: it should only show those customers whose surnames starts with the 3 letters 'Pat' and only the one-off payments for which the paid amount is £80 and under.

QUESTION 7
Create a **Comparative Analysis Table** to compare and contrast the **MySQL** Relational Database Management System and the **MongoDB** document-oriented database program with a view to inform the decision-making of the management of a firm.
Your comparison table should present **five clear comparison criteria** (or informative decision factors) as rows and have a column for MySQL and a column for MongoDB so that you can compare them side by side.
You could consider areas such as schemas, data consistency, storage, performance, workload, infrastructures, security, etc.

You need to reference your findings by making accurate citations to reliable external sources, using either the “Cite Them Right Harvard” or “Westminster Harvard” referencing systems.
You also need to include a list of references right at the end of your report.

For additional information on referencing, use the following resources:

- The University guidelines on referencing:
  https://libguides.westminster.ac.uk/referencing
- The “Cite Them Right Harvard” referencing guide:
  https://www-citethemrightonline-com.uow.idm.oclc.org/category-list?docid=CTRHarvard
- The “Westminster Harvard” referencing guide:
  https://www.westminster.ac.uk/sites/default/public-files/general-documents/Referencing%20Your%20Work%20booklet_06.1.pdf

Part B Marks Allocation

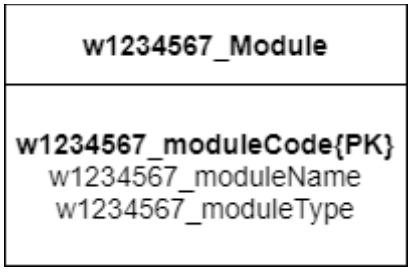
Part B will be marked based on the following marking criteria:

Marking Criteria	Marks
Clarity, formatting, and structure of the logical ERD with correct UML notations	05
Correct mapping of specialisations	20
Correct mapping of binary relationships of various multiplicities	15
Correctness of the SQL Query	05
Relevance of comparison criteria and decision factors used to compare two databases	15
PART B TOTAL	**60**

KEY REQUIREMENTS FOR THE ENTIRE COURSEWORK

- Only **UML notations** are accepted for this coursework, as introduced in this module.
- You need to **prefix** all your entities, tables, and attributes with "w + the 7 digits of your ID number" as provided by the University, both for **Part A (Tourmato Conceptual EERD)** and **Part B (BoilHeater Logical ERD and SQL query)**.

  For example, if my name is Francois Roubert and my ID number is w1234567, when I identify the entity or table "Module" and its attributes "moduleCode", "moduleName" and "moduleType", I will have to represent it this way:



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