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**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**COURSEWORK FOR**

BSC (HONS) IN COMPUTER SCIENCE

BSC (HONS) INFORMATION TECHNOLOGY

BACHELOR OF SOFTWARE ENGINEERING (HONS)

BSC (HONS) INFORMATION SYSTEMS (DATA ANALYTICS)

BSC (HONS) INFORMATION TECHNOLOGY (COMPUTER NETWORKING AND SECURITY)

**YEAR 1; ACADEMIC SESSION APRIL 2023**

**SEG1201: DATABASE FUNDAMENTALS**

**Part 1 Due date:** Week 9 Monday, 10am

**Part 2 Due date:** Week 11 Monday, 10am

**Parts 3&4 Due date:** Week 14 Monday, 10am

**Part 5** To be scheduled

**STUDENT NAMES:** \_\_\_\_\_

**STUDENT IDS:** \_\_\_\_\_

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**INSTRUCTIONS**

- This final assessment contributes 50% to your final grade.
- This four-member group assignment is primarily for Course Learning Outcome 2 - Implement a database design group project using appropriate tools such as Oracle SQL.

**IMPORTANT**

The University requires students to adhere to submission deadlines for any form of assessment. Penalties are applied in relation to unauthorized late submission of work.

**Academic Honesty Acknowledgement**

"We ..... verify that this paper contains entirely our own work. We have not consulted with any outside person or materials other than what was specified (an interviewee, for example) in the assignment or the syllabus requirements. Further, we have not copied or inadvertently copied ideas, sentences, or paragraphs from another student. We realize the penalties (*refer to page 16, 5.5, Appendix 2, page 44 of the student handbook diploma and undergraduate programme*) for any kind of copying or collaboration on any assignment."

....., (Student signatures/Date)

Important notes:

1. This database project requires active participation from each member.
2. If your group has only 2 members, then each group member will shoulder extra responsibilities.

There are 5 parts to the project:

Part 1: Enhance the chosen case scenario (10 marks)

Part 2: Design a database (30 marks)

Part 3: Implement a database (20 marks)

Part 4: Query a database (each sub-part carries 5 marks; max of 20 marks)

Part 5: Teamwork and Presentation (20 marks)

Part 1: Enhance the chosen case scenario (10 marks)

***Due date: Week 9 Monday, 10am***

Main Task:

- a) Choose one case scenario from Appendix 1.
- b) You are to enhance either case scenario 1 or case scenario 2 by including at least 2 entities and 2 relationships. In not more than 200 words, include your own scenario to complement the original chosen scenario.
- c) If you chose case scenario 3, you need to include at least 4 entities and 4 relationships and describe them in less than 400 words.
- d) The paragraphs must be added to the end of the original scenario, and hence known as the enhanced scenario.

What to submit:

- a) The enhanced scenario
- b) Business rules – these establish the constraints needed in the SQL script in Part 3

You may refer to the Data Modelling workbook (Section 3.6 case study) for some examples of business rules.

Important notes:

You can proceed to Part 2 of the assignment only if the enhanced scenario is approved.

Part 2: Design a database (20 marks)

***Due date: Week 11 Monday, 10am***

Main Task:

To design a database based on the requirements in the enhanced case scenario in Part 1.

What to submit:

- a) ERD in Crow foot or UML notation
- b) RDM

Important notes:

- Ensure that the ERD reflects the enhanced scenario. If an optionality is required, please indicate it in the diagram.
- Ensure that the M:M relationships are properly mapped to RDM (refer to Week 5 lecture notes slide 41 as an example)

### Part 3: Implement a database (20 marks)

**Due date: Week 14 Monday, 10am**

#### Main Task:

To develop and implement a custom database according to the output in Part 2.

#### Processes:

1. Based on the RDM in Part 2, provide a list of attributes together with the data types and justify your choice of data types of the custom database. The following table is an example. You may use the format as shown below.

Table/attributes	description	Data Type	Justification
<b>STUDENT</b>	Table name	-	
id	Student identification number	Number(9,0)	Fixed number of digits
name	Student name	Var-char2(30)	The name field value is a variable with different length
dob	Date of birth	date	Use the default date format
<b>COURSE</b>	table	-	
code	Unique code for each course	char6	Fixed number of characters eg; SEG1201

2. You are required to explore and implement two ORACLE built-in data types that have not been taught in this subject. To do this, you need to visit the Oracle website ([https://docs.oracle.com/database/121/SQLRF/sql\\_elements001.htm#SQLRF30020](https://docs.oracle.com/database/121/SQLRF/sql_elements001.htm#SQLRF30020)) to familiarize yourself with the various data types.

Note: please refer to SQL notes to ensure that your chosen data types are not found in the notes

3. Write a script called *DBscript* to create and populate the database using ORACLE DBMS. Ensure that the entity and referential integrities are correctly established. You are required to include the following requirements in the script file:
  - a. implement at least 5 user check constraints in any 5 tables of your choice. Note that NULL and key constraints are not regarded as user check constraints.

- b. define at least 2 indexes in the database tables (one index in one table). Explain why these tables need indexing by inserting the brief explanation as comments in the script file.
  - c. create 2 views of your choice to be used in Part 4.
- 4. Populate the database - create data of your choice by using the following as a guide:
  - a. Each table must have a minimum of 15 rows except for each event table, which requires a minimum of 20 rows. However, where not possible, you may create a lesser number of records according to the scenario. (an event table consists of date or date and time; example HIRE & ORDERS tables)
  - b. Each record must consist of 'real' data that reflects integrity. For examples,
    - i. If a field is defined as CHAR/VARCHAR2 data type, ensure that the data reflects the field name. For example, a field name *title* with data type VARCHAR2 may have data such as *Database is fun!* Instead of 101010101.
    - ii. If a field is defined as DATE data type, ensure that the date values reflect your scenario.
    - iii. If there is a 1:M relationship in your ERD, ensure that the primary (parent) records can be linked to 1 or **more** secondary (child) records.
    - iv. If your model has optionality, you need to reflect it in your data creation. In other words, some of the parent records may not have any child records.

**Part 4: Query a database (each sub-part carries 4 marks; max of 20 marks)**  
**Due date: Week 14 Monday, 10am**

Main Task:

Write FIVE user queries in a scenario format, and for each scenario, your SQL statement needs to meet the criteria stated in a - d.

An example of a user query based on a scenario:

*"Due to the new government ruling, only adults who are below 60 years and have taken the COVID-19 vaccination are allowed to book the Chillax Resort. As such, the management of Chillax Resort needs an ad hoc report of their guest bookings so that they can advise their guests accordingly. The report must be sorted by the guest age."*

- a. Write a user query with ONE sub-query (with no joins), and ONE new date function which have not been taught in this subject. Please explore the function from the ORACLE website (<https://docs.oracle.com/data-base/121/SQLRF/functions.htm#SQLRF006>)
- b. Write a user query with a 5-table join, TWO user conditions (note: the join and user conditions are not the same) and a GROUP BY clause and HAVING subclause. Ensure that your scenario reflects the reason for such join, and not join those tables for the sake of joining.
- c. Write a user query with a right outer join and THREE user conditions. One of the conditions uses the LIKE keyword.
- d. Write a user query using a unary join. Ensure that your scenario reflects the reason for such requirement. Display only the relevant records and fields.
- e. Answer the following question based on your chosen scenario

### **Case Scenario 1: Picky Pizza Palace**

List the staff whose surnames start with 'Ch' and who have served customers with addresses containing 'Jaya'

### **Case Scenario 2: Online Blood Donation System**

List all the donors who have donated blood 5 times in Hospital Beaufort since year 2020.

### **Case Scenario : Electric cars**

List the amount of time David Tang or/and his sister has spent on charging the car at charging station B in the campus for year 2023.

### **Important notes:**

- i. The SQL answers must be in the form of a screenshot that consists of both the SQL statement and the complete results. Please submit the screenshot with white background.
- ii. The queries must work with all reasonable sets of test data. For example, do not assume that *each guest only makes one booking*.
- iii. When a user query asks for information related to a guest name, your SELECT statement should contain that name. **Do not look up** the corresponding id or number and use that value in your answer.
- iv. SQL codes that are excessively complicated or messy (i.e., not in logical sequence) but yield correct results will have marks deducted.
- v. For verification purposes, each SQL statement must produce some results.

## Part 5: Presentation & Teamwork (20 marks)

**Due date: please refer to the presentation schedule**

### Main Task:

Each member in the group must show and explain his/her work in the lab. The group that has shown teamwork spirit will get some bonus marks.

Note: A submission without any presentation will be capped at 40 marks or a fail grade.

During the 30-minute oral presentation, team members must be ready to:

1. run the script file
2. run the SQL codes from Part 4
3. perform ad-hoc queries during the presentation.
4. explain the database design with regards to anomalies, dependencies, normalisation, etc

~~~~~ end of all parts of the final assessment~~~~~



### Summary of tasks and deliverables

| Part | Description                                 | Main Output/Deliverables                                                                                                                                                  |
|------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Select and enhance the chosen case scenario | An addition of about 200 words to be appended to the chosen scenario                                                                                                      |
| 2    | Design a database                           | ERD, RDM, business rules                                                                                                                                                  |
| 3    | Implement a database                        | Database script <ul style="list-style-type: none"><li>• create database tables</li><li>• create user data</li><li>• create views, index &amp; check constraints</li></ul> |
| 4    | Query a database                            | <ul style="list-style-type: none"><li>• User queries in scenario format</li><li>• SQL statements and results screenshot</li></ul>                                         |
| 5    | Presentation & Team-work                    | 30-minute presentation                                                                                                                                                    |

## APPENDIX 1

### Scenario 1: Picky Pizza Palace

Picky Pizza Palace sells pizzas in the Kuala Lumpur, Shah Alam, and Petaling Jaya regions in Malaysia. This food business offers pizzas through two main methods: delivery and dining-in. To introduce their menu of delicious pizzas to the public, Picky Pizza Palace utilizes pamphlets. Additionally, they have a website showcasing their menu and specialties as part of their business strategies.

The management stores information about their menu, including item number, description, type of food, and price. All food and drink items are identified by their item number. Orders placed by customers are recorded in the database, capturing details such as order number, customer number, order date, order time, telephone operator, rider number (identified by their staff number), and outlet number. Each order is recognized by its unique order number.

For each order, the database maintains a list of all food and drink items ordered by customers. This list, known as Order Lines, includes information such as the order number, item number, and quantity of each item for every order placed by a customer. Each record in the Order Lines is identified by its order number and item number.

Picky Pizza Palace operates eight outlets situated in Damansara Utama, Bangsar Baru, Kelana Jaya, Shah Alam, Setia Alam, Klang, and Subang Jaya. Information about the food outlets, such as outlet number, telephone number, street, suburb, and postcode, is stored in the database. Each outlet is identified by its unique outlet number.

Information about the staff, including their staff number, outlet number, title, first name, last name, phone number, street, suburb, postcode, position, date of entry into the company, and any disciplinary actions taken, is stored in the database. All staff members are identified by their staff number.

As a well-known pizza parlour, Picky Pizza Palace stores all customer information in their database, including customer number, phone number, title, first name, last name, street, suburb, and postcode. Each customer is identified by their customer number. This strategy of storing customer information aims to enhance productivity and professionalism in the business environment, making customers feel valued and emphasizing convenience for them.

Considering the success and rapid growth of their pizza business, Picky Pizza Palace keeps track of their vehicles' condition and usability by storing relevant information in a database for easy management. Details about their vehicles, such as vehicle number, vehicle product, type, date of purchase, last checked date, mileage, and outlet number, are recorded. Each vehicle is identified by its unique vehicle number.

## Scenario 2: Online Blood Donation System

Your team has been awarded by Ministry of Health (MoH) to design a database to be used as the back-end for the Blood Donation System (BDS) website. BDS is a digital platform designed to streamline and enhance the process of blood donation. It establishes a link between the blood donors and the organization and generate e-information. With the help of this application, anyone or any organization who wants to donate blood for a good cause can register themselves. In addition, for those who requires blood, they can register through this site.

Your team's role is to provide a well-designed database to ensure efficient and accurate data retrieval for MoH.

### Requirement Analysis

The system should maintain comprehensive records of blood donations, including donor details, donation dates, blood types, and any relevant medical history. Storing these records allows for easy tracking, management, and retrieval of blood units when needed. The database should also track the expiration dates of blood units to ensure their timely disposal.

Donors are individuals who donate blood voluntarily. Donor attributes may include name, contact information, blood type, next of kin and health history. Recipients are patients who need blood transfusions. Recipient attributes may include medical records, blood type, next of kin and urgency level. A donor can participate in several donation events. Similarly, a recipient can receive blood from several donors.

Hospitals and blood banks are associated with both donors and recipients, allowing for tracking of blood inventory and ensuring timely availability. Hospital attributes may consist of name, location, date the building was built, general phone line and facilities. Blood bank attributes may include storage capacity, blood type inventory, and expiration dates.

The system's database should include an inventory management component that tracks the available blood units within various blood banks. It should record the blood type, quantity, location, and storage conditions of each unit. This information facilitates efficient allocation and distribution of blood units based on demand and urgency.

To optimize the donation process, the system should allow donors to schedule appointments conveniently. The database should store appointment details, including date, time, and location. Additionally, the system can send automated reminders to donors to reduce appointment cancellations and no-shows.

The system should incorporate a powerful search that enables recipients or medical professionals to search for blood donors based on specific criteria such as blood type, location, and availability. The database should be designed to support quick and accurate searches to minimize response time.

### Scenario 3: Electric cars

David Tang is a Year 3 computer science undergraduate student majoring in Computer Networks and Security at Sunny University, which has a large campus. David owns a Tesla Model S electric car with a red color. The car has a registration number "TESLA001" and was manufactured in 2022. David's younger sister Sally is also studying at the University. Whenever David does not have a class, his sister would drive his car to the University.

At the University, David or his sister frequently use the charging stations on campus to charge his electric car. There are several charging stations available, each with multiple charging ports. The charging stations are located at various locations around the campus. To locate the charging stations, the details of the locations such as locationID, building name, floor/level and other relevant details need to be stored.

For each charging session initiated by the students, information such as date, start and end time, charging port used and the associated electric car will be recorded in a database. This helps in tracking the charging activity as well as usage patterns of electric cars on campus.

## APPENDIX 2

### Final assessment RUBRIC

| GRADE                                                                                                            | FAIL                                                                                                                     | D 40-49                                                                                                                                                                                                                                                                                                                                                               | C 50-59                                                                                                                                                                                                                                                                                                                        | B 60-69                                                                                                                                                                                                                                                                                                               | A >=70                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Learning Outcome 2 - Implement a database design group project using appropriate tools such as Oracle SQL | The student did not achieve CLO 2                                                                                        | The student achieves CLO 2                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                  | Missing ERD<br><br>OR/AND<br><br><6 correct primary/foreign keys identification<br><br>OR/AND<br><br>Missing script file | a. produce an ERD which reflects about 40% the scenario.<br>b. >5 correct primary/foreign keys identification<br>c. submit script file which can partially create and populate the database.<br>d. implement at least two user CHECK constraints correctly in the script file<br>e. correctly answer one question in Part 4<br>f. able to answer at least 2 questions | a. produce an ERD which reflects about 50% the scenario.<br>b. >6 correct primary/foreign keys identification<br>c. submit script file which can create and populate the database with acceptable data<br>d. implement at least three user CHECK constraints in the script file<br>e. correctly answer two questions in Part 4 | a. produce an ERD which reflects about 60% the scenario.<br>b. >7 correct primary/foreign keys identification<br>c. submit script file which can create and populate the database<br>d. implement at least four user CHECK constraints accurately in the script file<br>e. correctly answer three questions in Part 4 | a. produce an ERD which reflects >70% the scenario.<br>b. all correct primary/foreign keys identification<br>c. submit script file which can create and populate the database<br>d. implement at least five user CHECK constraints in the script file<br>e. correctly answer all questions in Part 4<br>f. able to answer at least 5 questions during the presentation. |

|  |                                        |                               |                                                                           |                                                                            |  |
|--|----------------------------------------|-------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|--|
|  | OR /AND<br><br>Missing<br>SQL<br>codes | during the presenta-<br>tion. | f.able to answer at<br>least 3 questions<br>during the presenta-<br>tion. | f. able to answer at<br>least 4 questions<br>during the presenta-<br>tion. |  |
|--|----------------------------------------|-------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|--|