SCHOOL OF SCIENCE AND ENGINEERING

COURSEWORK FOR
BSC (HONS) IN COMPUTER SCIENCE
BSC (HONS) INFORMATION SYSTEMS
BSC (HONS) INFORMATION TECHNOLOGY
BACHELOR OF SOFTWARE ENGINEERING (HONS)
BSC (HONS) INFORMATION SYSTEMS (BUSINESS ANALYTICS)
BIS (HONS) IN MOBILE COMPUTING WITH ENTREPRENEURSHIP
BSC (HONS) INFORMATION TECHNOLOGY (COMPUTER NETWORKING AND SECURITY)

YEAR 1; ACADEMIC SESSION APRIL 2021

SEG1201: DATABASE FUNDAMENTALS

DEADLINE: Week 14 – Thursday 8th July, 9 am

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- This final assessment (Assignment 2) contributes 50% to your final grade.
- This FIVE-member group assignment is for Course Learning Outcome 2 - Implement a database design group project using appropriate tools such as Oracle SQL.
- Each member of the group is required to present his/her part of the work.

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.

- Coursework submitted after the deadline but within 1 week will be accepted for a maximum mark of 40%.
- Work handed in following the extension of 1 week after the original deadline will be regarded as a non-submission and marked zero.

Academic Honesty Acknowledgement

"We Chong Kin Tze, Lam Hao Cheng, Tan Ae Le, Kwan Jia Chi, Masuma Shariff, 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."

C. K. T, L. H. C, T. A. L, K. J. C, M. A. S (Student signatures/ 7th July, 2021)

Instructions:

1. **Assignment presentation and schedule**
   Please refer to the online presentation schedule in MS TEAMS.

   An excellent or a good submission without presentation will be capped at 40 marks. Please refer to the rubrics in the Appendix in this document.

2. **Softcopy submission to eLearn**
   Please submit ONE zip file with the following content

   i. Video recordings of data modelling process that includes:
      a. the CEO/& user presentation
      b. database team interview together with Q&A
      c. database team presentation on data flow and data models
   ii. Project manager plan
   iii. WORD or PDF document that has answers to all the parts in this assignment.

3. For Part 2, you need to use an ERD tool to draw the diagram. You can use Diagram.net/LUCIDCHART/SMARTDRAW or any similar tool for the purpose.

4. For Part 4, the SQL answers must in the form of a screenshot that consists of both the SQL statement and the complete results. The queries must work with all reasonable sets of test data. For example, do not assume that *each guest only makes one booking*. Also, when a user query in Part 4 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. For more information, kindly refer to Assignment 1 instructions. SQL codes that are excessively complicated or messy (i.e., not in logical sequence) but yield correct results, will have marks deducted.

Introduction

Pre-requisite: This database project requires ***active*** participation from each member. If you decide to work with a group with less than five members, you or your team member(s) will require to play extra roles[1]. Your group will have two teams: the user team and database design team. Each team consists of a team leader and a member.

The following are the roles for a five-member team, and you are required to select ONE role:

i) CEO of company
ii) User of company
iii) Database team leader
iv) Database designer
v) Database project manager

Each team needs to meet online for weekly discussion and updates. After the meeting, each member will use MS TEAM form to evaluate the member's preparedness, punctuality, contribution (passive/active) in the meeting. The link to the form will be given in due course.

General scenario: Imagine that you own a company[2] which has a database system that handles the company's business transactions. Due to COVID-19 pandemic, the amount of data stored in the database has increased. However, the current database was poorly designed, and it has caused several database related problems; there were cases where vital data was lost when records deletion took place. In addition, with the huge volume of data, the record updates for any table in the current database have become very slow and the updates have caused data inconsistency in the database. In view of these serious database problems, which has caused the decline in the company's profit, you, who is the CEO of the company, have hired a reputable database design team to help solve the problem. A project manager is also hired to ensure the smooth delivery of the new database system.

There are four main parts involved in the database modelling and implementation as shown in Table 1 as follows:

[1] Please seek immediate help from the lecturer if you wish to have a 5-member team

[2] Please refer Table 2 for company selection

Table 1: Summary of tasks and deliverables

Part	Description	Main Output/Deliverables	Team in charge
1	Construct a case scenario - Company's scenario - Do a draft of a project plan. - Record the presentation	 A 500-word documentation Project plan Video recording	 User Project Manager Project Manager
2	Design a database	Flow chart diagram, ERD, RDM, business rules Project progress report	Design Project Manager
3	Implement a database	Database script – create database tables – create user data & check constraints Project progress report	 Design User Project Manager
4	Query a database (user testing)	User queries SQL statements and results Project progress report	User User and Design Project Manager
5	Presentation & Teamwork	20-minute online presentation	All members

Note: while the project manager (PM) may not be directly involved in the data modelling and database implementation process, he/she is helping in all these processes and hence the following tasks:

i) provide a project plan.
ii) monitor the project progress at every stage to ensure the success of the project. If there are some delays, the PM needs to alert the teams and make a revised project plan to be submitted to the lecturer.
iii) call for a weekly meeting, write minutes of meeting, and do video recording of the meetings.
iv) ensure the good quality of the output/deliverables for submissions. For example, if the case scenario is badly written or unclear, the PM needs to help rectify the errors, format, etc.
v) submit all the proof-read main outputs/deliverables on time.

Part 1: Construct a case scenario (20 marks)
(Formative assessment due on: 8 June; feedback will be given by 14th June)

The user team is to provide a company scenario which must consist of at least 8 entities to be presented to the database design team.

The user team needs to do the following:

i) select ONE company from Table 2. After watching the company's YouTube video, you may check the company's official website(s) for further details.
ii) write your company scenario based on the company of your choice in i). The write up should consist of the company's description, business requirements, business rules and an imaginary problem statement. The problem statement may consist of a paragraph which explains the company's current database problems and challenges. The scenario must be detailed enough to enable the database design team to understand the entities and their relationships. The write up should consist about 500 words with site references.
iii) present the company's business, the problems, and the business requirements to the database design team.

Once your scenario has been approved, you may proceed to Part 2 of the assignment.

Table 2: List of companies

Google	https://www.youtube.com/watch?v=Z-pT0XDYvDM
Microsoft	https://www.youtube.com/watch?v=lOTmYcxCxjU
Apple	https://www.youtube.com/watch?v=FzcfZyEhOoI
Amazon	https://www.youtube.com/watch?v=HL1UDYVnn9Q
Samsung	https://www.youtube.com/watch?v=xyoldCQCHlo
Alibaba	https://www.youtube.com/watch?v=fCJy0qY6NYI

Part 2: Design a database (20 marks)

Preliminary: The database design team is to interview and elicit what data to be stored in the database.

The database design team needs to do the following:

i) carry out a detailed analysis of the business to identify what is required to keep the business running smoothly and efficiently. The data gathering method to analyse the client's business and to identify the requirements can be done through interviews, surveys, and questionnaires. For example, the designer may like to interview the end user to understand the database and user requirements, and the regular or daily events and/or transactions that take place in the company.

ii) construct the scenario using a flowchart diagram and present it to the users for confirmation.

The PM needs to obtain the final requirement confirmation from both user and database design teams. Evidence must exist to indicate that the data modelling document has been read by both teams and agreed upon. They need to sign off the document prior to starting the database design process. The document has the following content

a. the scenario and scope of the project
b. user requirements
c. a sample of user queries
d. business rules

iii) design the concept of your database: Design team needs to use the results the business analysis to create a model that lays out the business objects (entities) of your company and establishes their relationships. This conceptual design of your database can be visualized on the ERD to show Entities, their Attributes and their Relationships. Use a modelling tool such as diagram.net to draw an ERD. Main output - ERD & business rules

iv) design the logical structure for your database: Once the relationships, properties and dependencies of the business entities have been identified and set, the design team can arrange the data into a logical structure, which is then mapped into the database by using tables. To create the logical structure of the database, the design team needs to do the following:

a. use the ERD to combine each entity and its properties/attributes into a table
b. check if there is any entity dependencies – this decides how the data in one table is related to the data in other tables
c. design the relational data model (include primary and foreign keys)
d. apply the normalization rules to the entire logical structure of the database. Ensure that all the tables are in Third Normal Forms (3NF)
e. analyse each table for anomalies. If they exist, they must be removed.
f. communicate the logical structure to users

Part 3: Implement a database (20 marks)

This stage relates to the physical design and implementation of the company's database in their business environment. The purpose is to develop and implement a custom database according to the logical structure in Part 2, and as such, the database design team needs to do the following:

i) based on the attributes given by the users, provide a list attributes together with the data types and justify your choice of data types of the custom database. You may need to visit Oracle website to familiarize with the various data types.

ii) write ONE script file to create and populate the database using ORACLE dbms.

a. create the database (i.e., implement Part 2-iv-c): Ensure that the entity and referential integrities are correctly established. You are required to implement at least FIVE user check constraints in any five tables of your choice. Note that NULL constraints are not regarded as user check constraints.

The users are to provide the check constraints to the design team for implementation.

b. populate the database: with the help from the user team, create data of your choice by using the following as a guide:

- Each table must have a minimum of 20 rows except for each event tables[3], which requires a minimum of 50 rows. However, where not possible, you may create lesser number of records according to the scenario.
- Each record must consist of 'real' and quality data that reflects integrity. For examples,
  - If a field is defined as CHAR/VARCHAR2 data type, ensure that the data reflects the field name.
  - If a field is defined as DATE data type, ensure that the date values reflect your scenarios.
  - If there is a 1:M relationship in your ERD, ensure that the primary records can be linked to 1 or ***more*** secondary records.
  - If your model has optionality, you need to reflect it in your data creation.

iii) carry out indexing of the database tables. Explain which tables need indexing.

[3] An event table is a transaction table which keep the company's transaction records, eg: borrow or loan table in a library database is considered as an event table. An event table would usually have a date(s).

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

The user team needs to write four user queries in a scenario format as follows:

> An example of a user query
> "*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.*"

For verification purposes, each SQL statement must produce some results.

i) Write a user query with two sub-queries and one function.

ii) Write a user query with a 3-table join, 2 user conditions[4] and a GROUP BY clause. Ensure that your scenario reflects the reason for such join, and not join those tables for the sake of joining.

iii) Write a user query with an outer join and 3 user conditions. One of the conditions uses LIKE keyword.

iv) Write a user query with table aliases and one date function. Ensure that your scenario reflects the reason for such requirements.

Part 5: Presentation & Teamwork (20 marks)

The purpose of the 20-minute online presentation is to verify the group work and to be fair to each member's contribution. Each member in the group must show and explain his/her work. Group that has shown good teamwork spirit will get some bonus marks.

Checklist:

i) run the script file
ii) be prepared to run the SQL statements from Part 4
iii) be prepared for some ad-hoc queries during the presentation.
iv) explain the database design – are there any anomalies, are the tables normalised, etc
v) explain how views can be used in the company's database environment

[4] Not the join conditions

APPENDIX

Assignment 2 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 OR/AND <6 correct primary/foreign keys identification Or /And Missing script file OR /AND Missing SQL codes	a. produce an ERD which reflects about 40% the scenario. b. >5 correct primary/foreign keys identification c. submit script file which can partially create and populate the database. d. implement at least two user CHECK constraints correctly in the script file e. correctly answer one question in Part 4 f. able to answer at least 2 questions during the presentation.	a. produce an ERD which reflects about 50% the scenario. b. >6 correct primary/foreign keys identification c. submit script file which can create and populate the database with acceptable data d. implement at least three user CHECK constraints in the script file e. correctly answer two questions in Part 4 f. able to answer at least 3 questions during the presentation.	a. produce an ERD which reflects about 60% the scenario. b. >7correct primary/foreign keys identification c. submit script file which can create and populate the database with good data d. implement at least four user CHECK constraints accurately in the script file e. correctly answer three questions in Part 4 f. able to answer at least 4 questions during the presentation.	a. produce an ERD which reflects >70% the scenario. b. all correct primary/foreign keys identification c. submit script file which can create and populate the database with good data d. implement at least five user CHECK constraints in the script file e. correctly answer all questions in Part 4 with good and efficient codes f. able to answer at least 5 questions during the presentation.