

Databases II

INF3703

Assessment 2

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Published: 1 May 2024, 08:00 AM
Due date: 28 June 2024, 08:00 PM
Total: 180

Assessment briefing

1. This is Assignment 2 of INF3703.
2. Do not cheat! If you do, I will know, I will catch you out – a zero mark will be rewarded. Do not copy any part of the assignment from other students. Your assignment should be your work and should be unique. This is part of your learning process in this module. It should be your learning that is reflected in the assignment report you submit.
3. If you want to submit this assignment on time, start immediately.
4. Before you start with the assignment, read it through. So, read the Case, Question 1, Question 2, Question 3, and Question 4.
5. **ATTENTION!** Except for Questions 1.1.1, 2.2.1, and 3.5.1, your student number must be included in all entity names. For example, if an entity's name is STUDENTS, make use of the following naming convention: STUDENTS_STUDENT NUMBER, that is, STUDENTS_39475964. The omission of your student number will result in a zero for the specific question.
6. Submit your solution(s) to Assessment 2 by uploading a PDF file to the INF3703-24-Y site on the myUNISA website.
7. The case of this assessment is an extension of the case presented in the Oct-Nov 2023 examination of the Software Project Management (INF3708) module – if you are interested in reading the original case, see [INF3708_OctExam2023_CASE.pdf](#) in Assessment 2 folder, which in turn, is stored in the ADDITIONAL RESOURCES section of the INF3703-24-Y module site.
8. While this case is inspired by true events, all names, characters, and incidents portrayed in this assessment has been pseudonymised. No identification of pseudonymised persons (living or deceased), places, buildings, and products should be inferred.

Case

Table Mountain Shopping Centres (TMSC) are a chain of malls located across the Cape Peninsula. The mall has been avoiding the use of automated pay stations to counter the negative effect that rapid technological advances have on employment growth. That is, they prefer to use the services of parking attendants (i.e., car guards) to help keep people employed amid the rush by various industries to adopt technology. Parking attendants are formally employed and paid a weekly wage by the Table Mountain Shopping Centres chain. To boost their weekly wage, parking attendants rely on cash tips. While the mall does not use automated pay stations, the managers acknowledge the advantages of having a cashless parking pay station and its associated technologies. For example, if you arrive at a station, you wave your hand in front of a motion sensor to initiate the issuing of a parking ticket. Motion sensors advance health safety by reducing the risk of contracting a virus like COVID by preventing physical touch. Furthermore, sensors installed at each parking space can detect the presence or absence of a vehicle; in the instance where it detects that a parking space is not occupied, it communicates this information to the parking station, which, in turn, prints the available parking space location ID (e.g., please park your vehicle at parking space A25). Therefore, human parking attendants are not needed in the presence of such advanced system (see Waldron-Curry, 2023).

To compete with these technological advantages, parking attendants use walkie-talkies to coordinate the allocation of an available parking spot. However, the shopping centre management observes that transaction technologies have been detrimental to cash tips. On the verge of the 4th industrial revolution, the phenomenon of physical cash that exchange hands has been showing a significant decline. Needless to point out, nowadays it is convenient to pay for purchases by simply swiping, inserting, or tapping your bank card. The managers furthermore notes that near field communication (NFC¹) technology has exacerbated the impact that technology-driven payments have on cash tips. Before NFC-enabled smartphones were designed, patrons would pay for goods and services by tapping their bank card; if they do not have cash on them, some of them would withdraw cash at an ATM to tip the parking attendants. When NFC-enabled smartphones were introduced, it solved an issue many people (mostly men) have with wallets; they now feel lighter without the burden of carrying bulky wallets and keep track of fewer things – they are only vigilant concerning their car keys and phone. It is worth noting that the automotive industry is already showing innovation of starting a car by smartphone (refer to DroneMobile, 2023). So, soon people will be going to the shops with only their smartphone!

Table Mountain Shopping Centres recently hired Skyworth Software Solutions (Skyworth) to explore the use of advanced digital technology to help people stay employed instead of contributing to unemployment. Skyworth will embark on an information systems project that seeks to equip parking

¹ “NFC is a method of wireless data transfer that allows smartphones, laptops, tablets and other devices to share data when in close proximity. NFC technology powers contactless payments via mobile wallets like Apple Pay and Google Pay, as well as contactless cards. ...NFC is a method of wireless data transfer that allows smartphones, laptops, tablets and other devices to share data when in close proximity. NFC technology powers contactless payments via mobile wallets like Apple Pay and Google Pay, as well as contactless cards. ...[i]t is limited to sharing data with other devices within about four inches. That’s why a consumer who’s paying with their mobile wallet must place their device close to the contactless payment reader.” (Fintech Insights, 2022)

attendants with a Wi-Fi-enabled point-of-sale (POS) device – the new design which resembles smartphones (see Figure 1 below) in physical appearance. Skyworth will specifically design customized merchant account software that can read the magnetic stripes of bank cards and the NFC chips of smartphones. In addition, the software streams a live video feed from the shopping centre's existing CCTV system of parking areas to help attendants identify available parking spaces and do security observation. Each parking attendant will access their merchant account using a unique identification number or facial recognition.

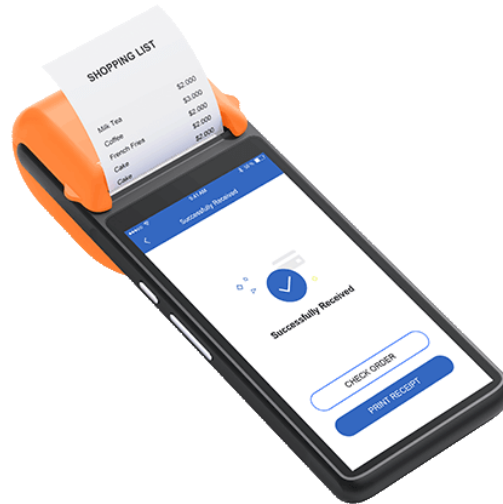


Figure 1: Android mobile POS (Telpo, 2023)

In the project kick-off meeting, Rafiq Hassan – Manager of the Bellville branch TMSC and the project sponsor – discussed the decision to section off a part of the parking area at each TMSC and convert it into a car wash. The car wash will present an additional opportunity for parking attendants to boost their income; after completing the morning shift, parking attendants have the option to work at the car wash for the second shift as part of a group of four people on car cleaning duty. The Programming Lead, Elelwani Hulisani, suggested that one POS is used per shift – whether it is a parking attendant or car wash shift. In the instance of a shift at the car wash, accessing the POS device will require four-tier authentication. That is, each of the four employees working on the shift needs to insert their identification number to gain access to a merchant account that divides the car wash amount paid by n^2 .

After you recently graduated with a B.Sc. (Hons): Information Systems from the University of South Africa, Skyworth appointed you as a database administrator who's part of the database management system (DBMS) team. Skyworth adopted the Systems Development Life Cycle (SDLC) to create, track and deliver the required activities for the TMSC POS devices project. The DBMS team will subject the design of the database to the phases of the Database Life Cycle (DBLC)

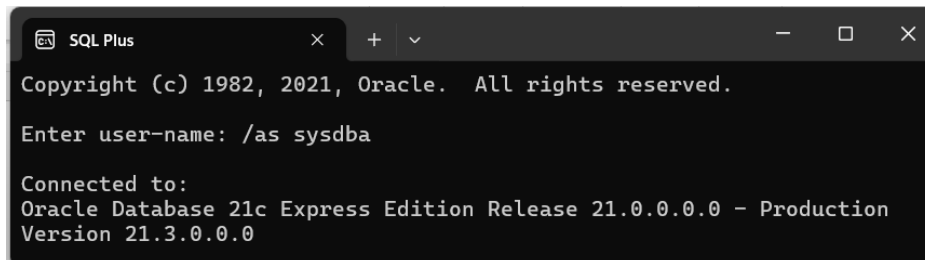
² $n = 4$

Question 1

[30]

As stated in the case, Skyworth follows the Systems Development Life Cycle (SDLC) (see page 529 of Coronel et al., 2020) to design information systems for their clients. In the planning phase, the database design and development team conducted a feasibility study to address, amongst others, the *technical aspects of hardware and software requirements* (see page 530 Coronel et al., 2020). The database architect³, Sanjay Kumar, promoted the Oracle Database 21c Express Edition and SQL Developer Tool to be deployed to design the database for the POS project. Sanjay instructed you to install and prep Oracle 21C for the physical design by performing the required configurations and troubleshooting.

- 1.1. You installed the Oracle Database 21c Express Edition for Windows x64 and the SQL Developer tool.
 - 1.1.1. Using SQL Plus, connect the SYS administrator account to the container database. Capture a screenshot showing only the necessary details, such as connection message and relevant database information. For example: (5)



```

SQL Plus
Copyright (c) 1982, 2021, Oracle. All rights reserved.

Enter user-name: /as sysdba

Connected to:
Oracle Database 21c Express Edition Release 21.0.0.0.0 - Production
Version 21.3.0.0.0
  
```

- 1.1.2. In SQL Developer, create a new connection profile for the SYS account and name it ASS2-ADMIN_CDB⁴_STUDENT_NUMBER (e.g., ASS2_ADMIN_CDB_39475964). Capture a screenshot of the NEW/SELECT DATABASE CONNECTION dialog box indicating connection STATUS : SUCCESS. (5)
- 1.2. In SQL Developer, create a new connection profile for the SYSTEM administrator account connecting to the pluggable database and name it ASS2_ADMIN_PDB_STUDENT NUMBER (e.g., ASS2_ADMIN_PDB⁵_39475964). Create a screenshot of the NEW/SELECT DATABASE CONNECTION dialog box indicating connection STATUS : SUCCESS. (1)
- 1.3. In SQL Developer, connect to ASS2-ADMIN_CDB-STUDENT NUMBER. Once connected, follow these steps to change the password of the SYSTEM user: (4)

³ The database architect designs and implements database environments (conceptual, logical, and physical). To fulfil the role of the database architect, one requires the skills of DBMS fundamentals, data modelling, SQL and hardware knowledge. See page 29 of Coronel et al., (2020).

⁴ CDB denotes 'container database'.

⁵ PDB denotes 'pluggable database'.

- Click the plus icon located to the left of the ASS2_ADMIN_CDB-STUDENT NUMBER connection to expand the container content and view the available objects within the container.



Screenshot 1: Click the plus icon located before Ass-Admin_CDB_student_number to expand the tree structure.

- Locate OTHER USERS at the end of the tree structure, then click the plus icon to expand the container content.
 - Locate SYSTEM, right-click and select EDIT USER.
 - In the EDIT USER dialog box, specify your student number as the new password.
- 1.3.1. In SQL Plus, connect to the SYSTEM account using your new password. Capture a screenshot of the SQL Plus window illustrating the SYSTEM user successfully connected to the database with new password.

1.4. Create a new tablespace⁶ In SQL Developer (5)

1.4.1. Assign the following details In the CREATE TABLESPACE dialog box:

- Name: TABLESPACE_STUDENT NUMBER. For example, TABLESPACE_ 39475964
- Tablespace Type: Permanent

1.4.2. Assign the following details in FILE SPECIFICATIONS tab:

- Name: "TABLESPACE_STUDENT NUMBER.DBF", e.g., "TABLESPACE_39475964.DBF"
- Directory: C:\app\Asus\product\21c\dbhomeXE\demo. Note: the path will be slightly different on your PC/laptop.
- File size: 50M
- Checkmark Auto Extent On
- Next Size: 10M
- Max Size: 100M

1.4.3. Capture a screenshot of the TABLESPACE tab displaying the information of TABLESPACE_STUDENT NUMBER. For example:

⁶ Watch INF3703 Webinar_The Oracle (Lesson 2).mp4 in which I demonstrate how to create a new tablespace.

Tablespace Name	Allocated (MB)	Free (MB)	Used (MB)	% Free	% Used	Max. Bytes (MB)
1 USERS	5	3	2	69	31	32768
2 TEMP	35	35	0	100	0	32768
3 TABLESPACE_39475964	50	49	1	98	2	100
4 UNDOTBS1	100	92	8	92	8	32768
5 SYSTEM	290	8	282	3	97	32768
6 SYSAUX	490	29	461	6	94	32768

1.5. In SQL Developer, connect to ASS2_ADMIN_PDB_STUDENT NUMBER and create a new user⁷.

(5)

1.5.1. Assign the following details in the CREATE USER dialog box:

- User Name: ASS2_STUDENT NUMBER, e.g., ASS2_39475964
- New Password: Student number, e.g., 39475964
- Default Tablespace: TABLESPACE_STUDENT NUMBER
- Temporary Tablespace: TEMP

1.5.2. In SQL Plus, connect to the SYSTEM user and write the SQL syntax that shows/verifies that ASS-2-STUDENT NUMBER is allocated to TABLESPACE_STUDENT NUMBER. Capture a screenshot.

1.6. In SQL Developer, capture a new connection profile for ASS2_STUDENT NUMBER. Capture a screenshot of the NEW/SELECT DATABASE CONNECTION dialog box showing connection STATUS : SUCCESS.

(5)

End of Question 1

Total: 30

⁷ Watch INF3703 Webinar_The Oracle (Lesson 2).mp4 in which I demonstrate how to create a new user.

Question 2

[50]

As stated in the case, Skyworth follows the DBLC to guide the design of the database. Currently, the database team is engaged in the conceptual design stage. During this stage, data modelling is utilised to create an abstract database structure that accurately represents the real-world objects. The conceptual model must reflect a clear understanding of the business and its functional area. Sanjay assigns various data modelling tasks to you, which can be completed using drawings or drawing software. It is important to note that the models generated during the conceptual design stage are hardware and software independent.

- 2.1. At the Table Mountain Shopping Centre located in Cape Town CBD, Siya Khumalo and Deacon Willemse are Heads of Maintenance (HOM). Their duties include managing the parking attendance, the car wash and general maintenance and upkeep of the shopping centre premises and infrastructure. Siya and Deacon will be responsible for issuing the POS devices to parking lot staff before their shift starts. This process is defined by the following business rule: An HOM may check out many POSs, and a POS may be checked out by many parking area staff. Additionally, the following observations inform the business rules: a parking area employee is not required to check out a POS device because parking area employees work in shifts, and a POS device does not need to be checked out to exist in inventory. After consulting with your fellow database administrators, you observe that the business rule is best captured in a composite entity relationship diagram (ERD). For an example, see Figure 11.2 on page 585 of Coronel et al. (2020).

- 2.1.1. Using entity modelling, define three separate (not linked) entities to graphically illustrate the business rules. Add the underscore character followed by your student number to each entity name. For example, TABLENAME_39475964.

(3 x 2) = (6)

- 2.1.2. Provide a brief description of the role of each entity.

(3 x 2) = (6)

- 2.1.3. Using entity modelling, define primary keys (PK) and foreign keys (FK) for...

- Entity 1; (2)
- entity 2; and the (2)
- the bridge entity (2 x 2) = (4)

- 2.2. The tables illustrated below – WASH_INV_GENERATOR_STUDENT NUMBER, CARWASH_SERVICE_STUDENT NUMBER, INVOICE_STUDENT NUMBER, and VEHICLE_REG_STUDENT NUMBER – are based on the shopping mall's car cleaning service. Note the following: although the car cleaning service exists, patrons are not required to use it. Conversely, some patrons regularly make use of the cleaning service.

Database name: TMSC_SHOPPING

Table name: INV_GENERATOR_STUDENT NUMBER

Primary key: Inv_number + Line_number

Foreign key: Inv_number, Service_code

Inv_number	Line_number	Service_code	Service_price
000-1	1	Vac_458	R40.00
000-1	2	Wash_458	R60.00
000-2	1	Wash_458	R60.00
000-3	1	Vac_458	R40.00
000-3	2	Wash_458	R60.00
000-3	3	Pol_458	R35.00

Table name: CLEANING_SERVICE_STUDENT NUMBER

Primary key: Service_code

Foreign key: none

Service_code	Service_descript	Service_Price
Vac_458	Vacuum	R40.00
Wash_458	Wash	R60.00
Pol_458	Polish/buff	R35.00

Table name: INVOICE_STUDENT NUMBER

Primary key: Inv_number

Foreign key: Vehicle_reg

Inv_number	Vehicle_reg	Inv_date
000-1	CA 78581	23-Apr-24
000-2	CA 87514	23-Apr-24
000-3	CA 98712	29-Mar-24
000-4	CA 78581	30-Apr-24

Table name: VEHICLE_REG_STUDENT NUMBER

Primary key: Vehicle_reg

Foreign key: none

Vehicle_reg	Customer_phone
CA 78581	0825875954
CA 87514	0782582582
CA 98712	0829872528

- 2.2.1. Mariaan De Wet, the database designer with more than 10 years' experience in database design, deployed the relational model (see page 41 Coronel et al., 2020) to conceptualise the tables. Sanjay instructs you to convert the tables into corresponding business rules for documentation purposes.

Examine each table's attributes, records, primary key allocation, and foreign key allocation. Formulate the business rules that underpin the relationships between the tables.

(3 x 4) = (12)

- 2.2.2. Create an ERD that includes multiplicities, association names, and association directions to illustrate the connections between the entities. (9 x 2) = (18)

End of Question 2

Total: 50

Question 3

[50]

Following the conceptual phase, the database team engaged with the logical database design phase. The aim of the logical design stage is to map the conceptual model into a logical model that can then be implemented on a relational DBMS. Not all database elements can be modelled and must be enforced at application⁸ level (the logical design phase). For example, the constraint ‘a parking attendant must return a POS device after 5 hours, when a shift ends’ cannot be reflected in an ERD. See Table 11.5 on page 601 of Coronel et al. (2020) for more information about integrity constraints.

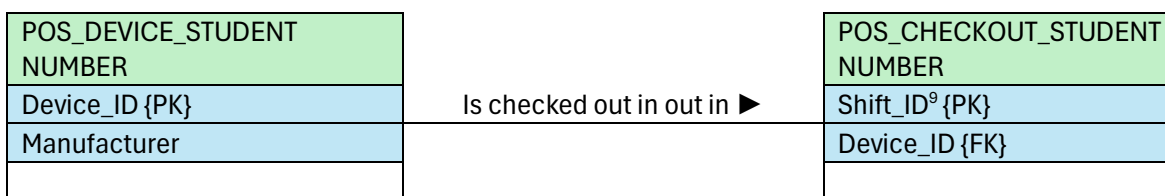
- 3.1. Step 1 of the logical design phase involves creating relations for strong entities. A strong entity (see page 117 of Coronel et al., 2020) refers to a table that can be uniquely identified by its attributes without requiring any relationship with other entities. Therefore, a strong entity can exist on its own and is independent.

- 3.1.1. Examine the POS_Device entity as illustrated below. Formulate the POS_DEVICE_STUDENT NUMBER relation. (2)

POS_DEVICE_STUDENT NUMBER
Device_ID {PK}
Manufacturer

- 3.2. Step 2 of the logical design phase involves creating relations for weak entities. A weak entity (see page 181 of Coronel et al., 2020) refers to an entity that is existence dependent; that is, it cannot exist without the entity with which it has a relationship.

- 3.2.1. Examine the ERD below, illustrating the relationship between the entities POS_Device and POS_Checkout. Formulate the relation for the weak entity. (4)



⁸ The term ‘application’ in the context of the logical design phase derives from the verb ‘apply’ and should not be confused with application software.

⁹ The PK attribute Shift_ID derives from an entity called SHIFT_ALLOCATION_STUDENT NUMBER. Shift_ID determines the following values in SHIFT_ALLOCATION_STUDENT NUMBER: Shift_ID → Employee_ID, Designation, Shift_Date, Shift_Start_Time, Shift_End_Time. The Designation domain comprises ‘parking attendant service’ and ‘car cleaning service’.

- 3.2.2. Define SHIFT_ALLOCATION_STUDENT NUMBER in table format. The table must only contain two rows to illustrate that an employee can work two shifts on one day. Specify the table name, the primary key, and the foreign key.

$$(3 \times 1) + (3 \times 3) = (12)$$

- 3.3. Step 3 of the logical design phase involves mapping multivalued attributes (see page 596-597 of Coronel et al., 2020). Examine the entity titled PARKING_LOT_EMPLOYEES_STUDENT NUMBER as illustrated in the graphic below.

PARKING_LOT_EMPLOYEES_STUDENT NUMBER
Employee_ID {PK}
Employee_name
Employee_surname
Employee_contact

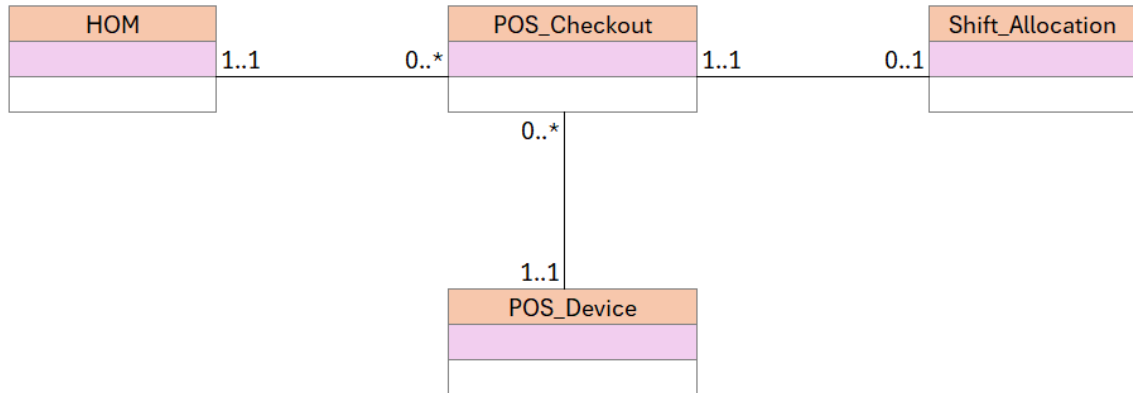
- 3.3.1. Which attribute is the multivalued attribute? Motivate your answer. $(2 \times 2) = (4)$
- 3.3.2. Using entity modelling, define a new entity composed of the original multivalued attribute. Include your student number in formulating the entity name and specify the PK. (4)
- 3.3.3. Formulate the new entity's relation. (2)
- 3.4. Step 4 of the logical design phase involves mapping binary relations. The DBMS team successfully mapped one-to-many (1:*) and many-to-many (*:*) relationships. The team will now attempt to map the one-to-one (1:1) relationship between the POS_CHECKOUT_STUDENT NUMBER and SHIFT_ALLOCATION_STUDENT NUMBER entities. This 1:1 relationship is informed by the business rule that only one POS device can be checked out for a shift. A shift can be allocated to 1 and a maximum of 4 parking area employees. Each of the four employees assigned to a parking attendant services shift can check out a POS device based on the notion that each person is patrolling a different area of the parking area. So, the relationship between SHIFT_ALLOCATION_STUDENT NUMBER and POS_CHECKOUT_STUDENT NUMBER is a mandatory one. Conversely, in the case of shifts related to car cleaning services, only one employee can check out a POS device on behalf of the group of four¹⁰. Therefore, the POS_CHECKOUT_STUDENT NUMBER to SHIFT_ALLOCATION_STUDENT NUMBER relationship is optional. Based on the principles of relational calculus, the service price amount is divided by four.
- 3.4.1. Create an ERD that comprise multiplicities, association names and association directions to illustrate the 1:1 relationship between POS_CHECKOUT_STUDENT NUMBER and SHIFT_ALLOCATION_STUDENT NUMBER. Examine Coronel et al.'s

¹⁰ A vehicle is cleaned by four people. For example, one person is responsible for washing the car with cleaning foam and a high-pressure sprayer, another person will do the drying, someone will do the vacuuming, and so forth.

(2020, p. 598) mapping of the “1:1 relationship ... between the entities LECTURER and SCHOOL” to guide you. $(6) + (2 \times 2) = (10)$

- 3.4.2. Formulate the relations of both the POS_CHECKOUT_STUDENT NUMBER and SHIFT_ALLOCATION_STUDENT NUMBER entities. $(2) + (4) = (6)$

- 3.5. Step 5 of the logical design phase involves mapping ternary relations (see page 187). Examine the ternary relationship between the entities HOM, POS_DEVICE and SHIFT_ALLOCATION as illustrated in the simplified ERD below.



- 3.5.1. Formulate the business rules that underpin the ternary relationship.

$$(3 \times 2) = (6)$$

End of Question 3

Total: 50

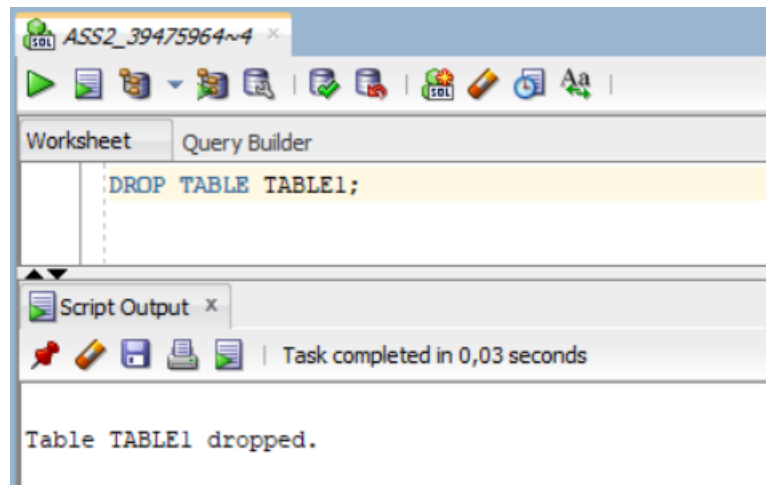
Question 4

[50]

After completing the logical design phase, the database team transitioned to the physical database design phase. This phase entails defining specific storage or access methods for the database. To achieve this, the team translates the logical model into a set of DBMS specifications for storing and accessing data. The database administrator utilizes SQL to create database and table structures, perform data manipulation and administration tasks, and execute queries to extract useful information. In this project, the database team adopted the agile scrum strategy (Vijay, 2024), with two database administrators (yourself and Clarence Tshwete), Mariaan De Wet as the database designer, and Lindiwe Bhengu as the data scientist. Sunjay serves as the scrum master. Your primary task for day 1 of the sprint is to verify referential integrity by ensuring the correct primary keys and foreign keys are in place. This involves enforcing referential integrity to prevent deletion of related records until all associated data has been removed. For example, in a scenario where one table contains information about each TMSC shopping centre and another table shows two Heads of Maintenance (HOMs) working at each shopping centre, referential integrity would prevent deletion of shopping centre information until all associated HOM records are deleted. A more illustrative example of referential integrity is provided by Coronel et al. (2020, pp. 601–602) in their explanation of the 'DVD' and 'COPY' relation. In this scenario, a movie in the DVD relation should not be deleted until all copies in the COPY relation have been removed. At the end of the sprint, you are expected to produce an Entity-Relationship Diagram (ERD) to visually illustrate referential integrity. Clarence will focus on checking and validating integrity constraints of domain datatypes and is expected to produce a data dictionary that includes these constraints. Based on the focus area of each assigned task, your sprint does not involve validating and checking integrity constraints. Therefore, the forthcoming instructions specify 'VARCHAR(2)' as a 'generic' datatype. Perform the actions below in the ASS2_STUDENT_NUMBER schema in SQL Developer.

- 4.1. You are presently engaged in creating a table to capture the information of the HOMs.
 - 4.1.1. Use the CREATE TABLE SQL statement to create a table named HOM_STUDENT
NUMBER. (2)
 - 4.1.2. Use the column parameter to specify attributes in the bulleted list below, assigning
the VARCHAR(20) datatype to each attribute:
 - HOM_ID (1)
 - HOM_Name (1)
 - HOM_Surname (1)
 - HOM_Contact (1)
 - MALL_ID (1)
 - 4.1.3. Use the PRIMARY KEY constraint to identify HOM_ID as the primary key. Name the
constraint PK_HOM_ID. (6)

- 4.1.4. Run the script and then capture a screenshot in which the profile name (ASS2_STUDENT NUMBER), the SQL command, and Script Output (indicating table was created) is clearly visible. See example below:



- 4.1.5. Save¹¹ the worksheet that contains the SQL CREATE TABLE command as Q4-1-HOM-table-Student Number.sql in case you need to retrieve and edit the file later.
- 4.2. Access the HOM_STUDENT_NUMBER table. (6)
- 4.2.1. Use the INSERT ROW function under the DATA tab to populate HOM_STUDENT NUMBER with the values displayed in the graphic below.

HOM_ID	HOM_Name	HOM_Surname	HOM_contact	MALL_ID
HOM-456	Siya	Khumalo	0214585578	1-TMSC
HOM-457	Deacon	Willemse	0214585578	1-TMSC
HOM-887	Reginald	Jantjies	0214589715	2-TMSC
HOM-888	Caroline	Masina	0214589715	2-TMSC
HOM-004	Arshi	Ahmed	0214587741	3-TMSC
HOM-005	Dirk	Van Der Westhuizen	0214587741	3-TMSC

- 4.2.2. Run the script and capture a screenshot where the table name, values and MESSAGES-LOG are clearly visible.
- 4.3. You are currently creating a table to capture information about the different TMSCs:
- 4.3.1. Use the CREATE TABLE SQL statement to create a table named TMSC_STUDENT NUMBER. (2)
- 4.3.2. Use the column parameter to specify attributes listed below, assigning the VARCHAR(20) datatype to each attribute:

¹¹ Note, this is non scoring instruction. That is, the question is not counting towards the Assessment 2 score.

- Mall_ID (1)
 - Location (1)
- 4.3.3. Apply the PRIMARY KEY constraint to identify Mall_ID as the primary key. Name the constraint PK_Mall_ID. (6)
- 4.3.4. Run the script and then capture a screenshot in which the profile name (ASS2_STUDENT NUMBER), the SQL command, and Script Output (showing successful table creation) is clearly visible.
- 4.3.5. Save the worksheet as Q4-2-TMSC-table-Student Number.sql in case you need to retrieve and edit the file later.
- 4.4. Use the SQL INSERT INTO statement to populate TMSC_STUDENT_NUMBER with the values displayed in the graphic below. (3)

Mall_ID ¹²	Location
1-TMSC	Cape Town CBD
2-TMSC	Bellville
3-TMSC	Muizenberg

- 4.4.1. Capture a screenshot in which the profile name (ASS2_STUDENT NUMBER), the SQL command, and Script Output is clearly visible.
- 4.4.2. Save the worksheet that contains your SQL INSERT INTO command as Q4-2-Insert-into-TMSC-Student Number.sql in case you need to retrieve and edit the file later.
- 4.5. Use the ALTER TABLE SQL statement to add Mall_ID as a FOREIGN KEY constraint to the HOM_STUDENT_NUMBER table. Name the constraint FK_Mall_ID (8)
- 4.5.1. Capture a screenshot in which the profile name (ASS2_STUDENT NUMBER), the SQL command, and Script Output is clearly visible.
- 4.5.2. Save the worksheet that contains your SQL INSERT INTO command as Q4-3-ALTER-HOM-39475964.sql in case you need to retrieve and edit the file later.
- 4.6. Access the constraints tab of HOM_STUDENT NUMBER. (2)
- 4.6.1. Capture a screenshot in which the table name, the constraint_name column, and the constraint_type column are clearly visible.

¹² The corresponding MALL_ID field in the HOD_STUDENT NUMBER table suggest that Siya and Deacon are HOMs at the Cape Town CBD TMSC shopping centre, that Reginald and Caroline are HOMs at the Bellville TMSC shopping centre, and that Arshi and Dirk are HOMs at the Muizenberg TMSC shopping centre.

- 4.7. In the TMSC_STUDENT NUMBER entity, attempt to remove the row where the MALL_ID is equal to 2-TMSC. (2)
- 4.7.1. Capture a screenshot in which the table name, the table values, and the message in MESSAGES-LOG is clearly visible.
- 4.8. Generate an ERD to visually illustrate the relationship between HOD_STUDENT NUMBER and TMSC_STUDENT NUMBER. Capture a screenshot. (6)

End of Question 3
Total: 180

Epilogue

Presently, you are about to engage with the second scrum sprint (Week 2). In the meeting Sanjay held earlier, he reported that the sprint backlog is cleared – the entity relationships meet the rules of referential integrity. The sprint wish list for this week will predominantly focus on delivering a product capable of performing relational algebra involving the INV_GENERATOR, CLEANING_SERVICE, INVOICE, VEHICLE_REG entities. In particular, the product must produce a subtotal by counting the SERVICE_PRICE of selected services, then add VAT (15%) to produce the invoice TOTAL. This narrative will be continued in INF3703 MS Teams lessons. To be continued...

End of Assessment 2

Total: 180

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