QUESTION 1

1. A company has only two types of clients: personal and business. The data stored on personal clients includes the client number, name (first and last name), home address, phone number, date of birth and driving license number. The data stored on business clients includes the client number, name of business, type of business, address, telephone and fax numbers. The client number uniquely identifies each client and the information stored relates to all clients who have hired in the past and those currently hiring a vehicle.

    a. Based on the description above draw the EERD. (4 marks)

    b. What are the participation and disjoint constrains for the above EERD? (2 marks)

2. Introduce specialization/generalization concepts into the ER model shown below and the description below. (9marks)

Customer	0..1	purchases >	1..*	Item
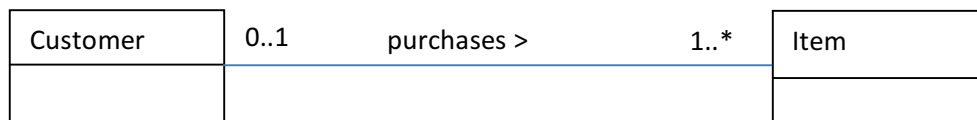
    a) A department store sells many items such as Toys, Electronic Item and Clothing.
    b) Certain toys can be categorised as Electronic Item.
    c) The toys in the department store can be categorised as Infant Toy, Bicycle and Soft Toy.
    d) Some toys are not being categorised as the three main categories in the Toy Categories.

QUESTION 2

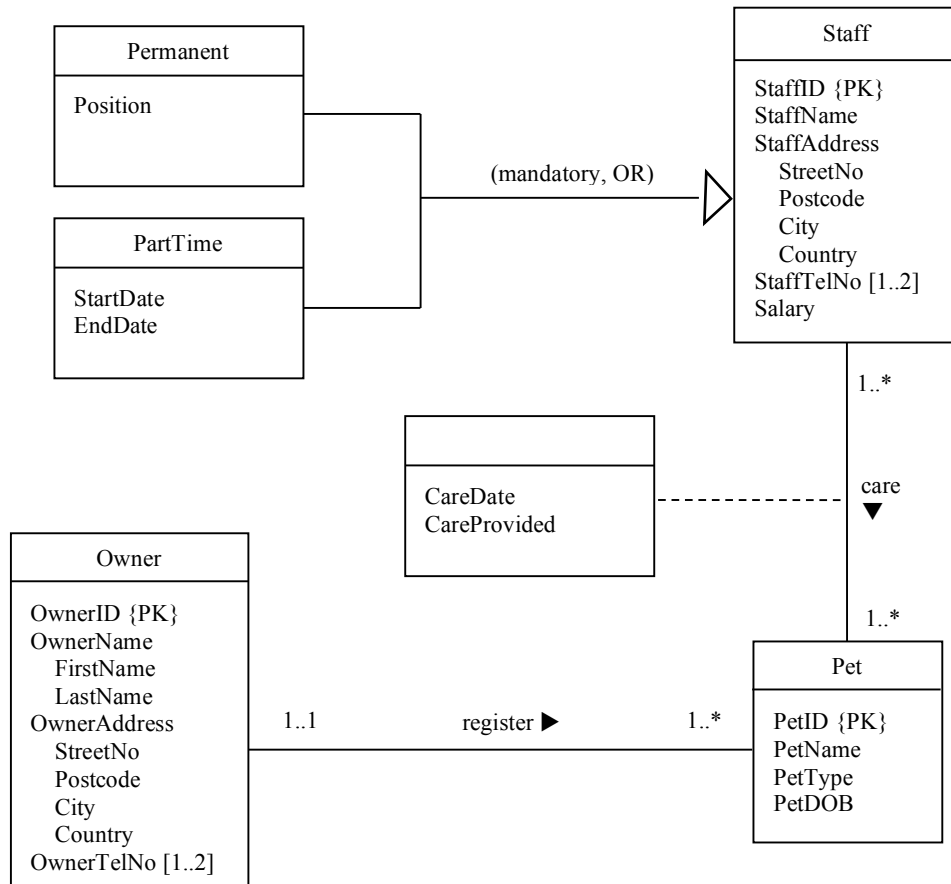Derive the relational schema for Conceptual Entity Relationship Diagram in Figure 2.1 below.

(15 marks)

Permanent
Position

PartTime
StartDate
EndDate

(mandatory, OR)

Staff
StaffID {PK}
StaffName
StaffAddress
StreetNo
Postcode
City
Country
StaffTelNo [1..2]
Salary

1..*

CareDate
CareProvided

care ▼

1..*

Owner
OwnerID {PK}
OwnerName
FirstName
LastName
OwnerAddress
StreetNo
Postcode
City
Country
OwnerTelNo [1..2]

1..1   register ▶   1..*

Pet
PetID {PK}
PetName
PetType
PetDOB

Figure 2.1: Conceptual Entity Relationship Diagram

QUESTION 3

Sun Mart sells a variety of products. The manager keeps a record on its customers' purchases as follows:

Table 1: Customer Ordering by Sun Mart

LastName	OrderID
Baba	1,3,5
Irfan	2,4
Leo	6
Lim	7
Maniam	8

Table 2: Customer Profile by Sun Mart

Cust_ID	FirstName	LastName	Address	City	State	Zip
1	Ali	Baba	123, Jalan Kebudayaan	Skudai	JH	81300
2	Ahmad	Irfan	231, Jalan Kebangsaan	Skudai	JH	81300
3	Sandy	Leo	11, Jalan Tampoi	Tampoi	JH	81200
4	Maria	Lim	11, Jalan Tampoi	Tampoi	JH	81200
5	Subra	Maniam	13, Jalan Tampoi	Tampoi	JH	81200

Table 3: Customer Billing by Sun Mart

OrderID	ProdID	Price	Quantity	Total	Membership(10%Discount)	GTotal
1	AB-111	15	10	150	Yes	135
3	ZA-245	5	20	100	Yes	90
5	AB-111	15	10	150	Yes	135
2	AB-111	15	20	300	No	300
4	ZA-245	5	20	100	No	100
6	MB-153	10	10	100	Yes	90
7	ZA-245	5	10	50	Yes	45
8	ZA-245	5	10	50	No	50

You are required to:
  (1) Normalise the above Table 1 into a NEW table in its First Normalisation Form. (1%)
  (2) Normalise the above Table 2 into two NEW tables in its Second Normalisation Form. (4%)
  (3) Normalise the above Table 3 into three NEW tables in its Third Normalisation Form. (4%)
  (4) Explain two importance of normalisation.
 (Note: In your NEW tables, show its foreign key(s) when necessary)

QUESTION 4
Student

ID	Name	College	Hometown
S011	Naim	KT7	Parit
S021	Melanie	FM2	Felda New Zealand
S031	Husna	ZK9	Mambang Di Awan
S041	Gopi	KT3	Kodiang

Residential

No	Name	Room
FM2	Tun Pusmah	150
KT7	Warisan	500
MN1	Mahsuri	250
ZK9	Samudera	300
CS6	Hidayah	350

Instructor

ID	Name	Hometown
A21	Shahmi	Kodiang
A31	Ting Ting	Kampung Wireless
A51	Nurhafiza	Felda New Zealand

Answer:

a) Based on the above tables, construct SQL statement for:

    i.   Select all residential college names where number of room is greater than 250.

(2 points)

    ii.   Select all student information and sort the result according to their name.

(2 points)

    iii.   Calculate how many residential college with number of room is less than 350 and the total number rooms available from these residential colleges. Use alias to store both results.

(2 points)

    iv.   Select all hometowns where both student and instructor came from.

(2 points)

    v.   Insert your data into Student table.

(2 points)

b) Identify the result for the following SQL statements:

    i.   SELECT No, Name
        FROM Residential
        WHERE Room > SOME
                    (SELECT Room
                     FROM Residential
                     WHERE No = 'ZK9');

(2 points)

    ii.   SELECT a.*, b.*
        FROM Student a RIGHT JOIN
        Residential b ON a.College = b.No;

(3 points)

SECTION B : CASE STUDY **[40 MARKS]**

INSTRUCTION : ANSWER ALL THE QUESTIONS IN THIS SECTION.

In Universiti Teknologi Malaysia (UTM), final year student need to fill up graduation form before they are allowed to graduate. At the moment, the process is done manually by fill-in the Graduation Form as in **Appendix A**. UTM Academic Management has requested this process to be computerized. Assuming that, you are appointed as the Database Designer for this project. Due to that, you need to analyze the Graduation Form as in **Appendix A** and complete the following tasks:

a) Produce relation schema in First Normal Form and identify ALL *functional dependencies*.

(8 marks)

b) Identify *partial dependencies* if exist and produce relation schema in Second Normal Form.

(15 Marks)

c) Identify *transitive dependencies* if exist and produce relation schema in Third Normal Form.

(8 Marks)

d) Based on (c), draw the complete logical Entity Relationship Diagram (ERD).

(9 Marks)