

## SECTION A (60 MARKS)

1. Illustrate **ONE (1)** example of database system in the following domains:

a) Transportation

**(2 marks)**

- Airline Ticketing System that stores related data about flights, crews, pilot, airports and trips.
- Customer can search their desired flight and destination and purchase their ticket online

b) Education

**(2 marks)**

- University Registration System that stores related data about students, lecturer, courses.
- Students can perform online registering of their courses before semester starts.

2. Describe **TWO (2)** components of database system environment.

**(4 marks)**

Any 2 answers:

- Hardware can range from a PC to a network of computers.
- Software including DBMS, operating system, network software (if necessary) and also the application programs.
- Data that are used by the organization and consists of operational data and the meta-data.
- Procedures which are instructions and rules that should be applied to the design and use of the DBMS.
- People include various roles like Data Administrator, Database Administrator (DBA), Database Designers, Database Application Programmers and End Users (naive and sophisticated).

3. State **TWO (2)** phases of database design.

**(2 marks)**

- a. **Conceptual database design**
- b. **Logical database design**
- c. **Physical database design**

4. List **TWO (2)** purposes of database administration.

**(2 marks)**

- Management of physical realization of a database
- Management of data resource including

5. Explain the concept of derived attribute in Entity Relationship Model. Provide **ONE (1)** example of derived attribute.

**(3 marks)**

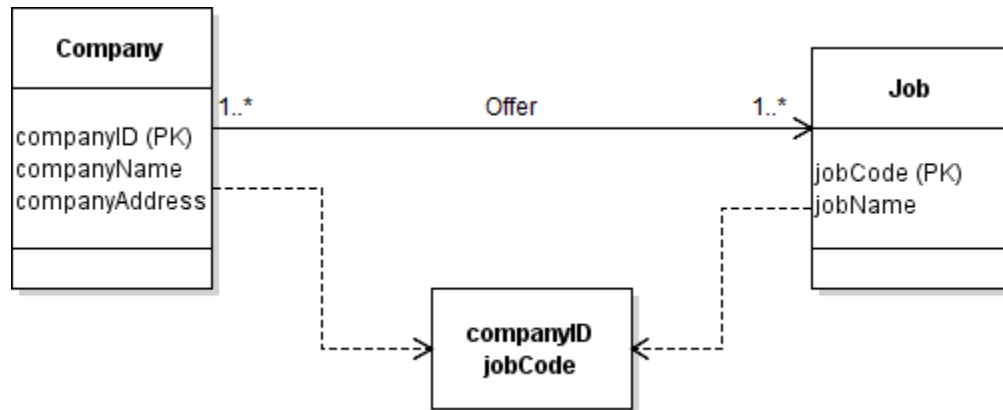
- Derived attribute: Attribute that represents a value that is derivable from value of a related attribute, or set of attributes (e.g. the duration attribute is calculated from start and finish attributes).

6. Draw a complete ER diagram with attributes to represent the business rule given below:

“A Company may offer a number of Jobs with some Jobs may be offered by different Company”.

**(3 marks)**

**Answer:**



7. Explain the problem of chasm trap in designing Entity Relationship Model.

**(2 marks)**

A chasm trap problem where pathway does not exist between certain entity occurrences although a model suggests the existence of a relationship between the entity types.

8. Give **ONE (1)** example of domain for attribute in a relation.

**(2 marks)**

Example: Matric Number is student identification number – a numeric value from 10000 – 30000 or any acceptable example.

9. Explain **ONE (1)** example of Enterprise Constraint in an Education system.

**(2 marks)**

Additional rules specified by users or database administrators.

Example: Student can takes 6 subjects for each semester or each subject can be taken by 100 students or any acceptable answer.

10. Answer the following questions based on the table shown below:

studID	sName	sAddress	courseCode	courseName
S233714	Hamizah Muhd	Alor Setar, Kedah	BIT	Information Technology
S230780	Amjadi Ali	Bangi, Selangor	MM	Multimedia
S231760	Nurazean Noor	Kuala Lumpur, WP	BIT	Information Technology
S231075	Aidil Akmar Shuib	Kuala Lumpur, WP	COM	Communication
S232441	Syed Rizal Razak	Ipoh, Perak	BUS	Business

a. The above table is susceptible to update anomalies. Explain and provide **ONE (1)** example for each of the insertion, deletion and modification anomalies.

**(6 marks)**

- Insertion anomaly  
Happen when a new row cannot be inserted unless all primary key values are supplied.  
Example - To insert new course information, we must know the student ID because this is primary key and we cannot assign NULL value for the primary key. **[2 marks]**
- Deletion anomaly  
Deleting a row results in losing important information not stored elsewhere.  
Example – If we delete a record from the table that represents the student, for example, Amjadi Ali, the details about the course (i.e. Multimedia) also will be lost from the database. **[2 marks]**
- Modification anomaly  
A simple update must be applied to multiple rows.  
Example – if we change the value of the courseName (e.g. from Information technology to Bachelor of Science in Information Technology), several records need to be changed.  
**[2 marks]**

b. Explain the concept of functional dependency and give **TWO (2)** example of functional dependency from the above table.

**(4 marks)**

Functional dependency describes relationship between attributes in a relation. If A and B of a relation R, B is functionally dependent on A if each value of A in R is associated with exactly one value of B in R. **[2 marks]**

Examples: **[2 marks]**

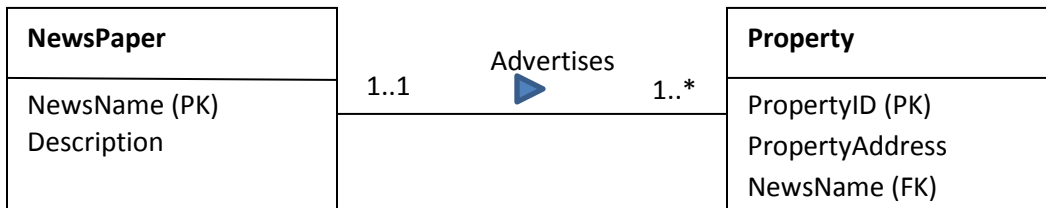
- studID functionally determines sName and sAddress
- courseCode functionally determines courseName

11. List **TWO (2)** examples of data types and declarations in *ISO SQL* data types.

**(2 marks)**

1. boolean: BOOLEAN
2. character: CHAR VARCHAR
3. interval: INTERVAL
4. datetime: DATE TIME TIMESTAMP
5. approximate numeric: FLOAT REAL DOUBLE PRECISION

12. Discuss 'CASCADE' and 'SET NULL' as *Integrity Enhancement Features based on Entity Relationship Diagram below.*



**(3 marks)**

**Answer:**

- **CASCADE:** A feature to delete row from parent (NEWSPAPER) and delete matching rows in child (PROPERTY), and so on in cascading manner.
- **SET NULL:** Delete row from parent (NEWSPAPER) and set FK column(s) in child (PROPERTY) to NULL (only valid if FK columns are NOT NULL).

13. Based on the BOOK table below, write SQL statements to perform the following:

BOOK (bookID, bookTitle, author, unitPrice)

a) Create the BOOK table (use appropriate attributes and define the primary key).

**(4 marks)**

**Answer:**

```
CREATE TABLE BOOK
    (bookID INTEGER NOT NULL,
    bookTitle TEXT(20) NOT NULL,
    author TEXT(30) NOT NULL,
    unitPrice INTEGER,
    PRIMARY KEY (bookID));
```

b) Insert the following data into BOOK table.

**(2 marks)**

```
bookID=77
bookTitle='AGENT TECHNOLOGY FOR E-COMMERCE'
author='MARIA FASLI'
unitPrice=199
```

**Answer:**

```
INSERT INTO BOOK VALUES (77,'AGENT TECHNOLOGY FOR E-COMMERCE', 'MARIA FASLI',199);
```

14. Using SQL statements, create view of Student1 to display studentID, name, age and gender from the Student table.

**(2 marks)**

```
CREATE VIEW Student1
AS SELECT studentID, name, age, gender
FROM Student;
```

15. Analyse the SQL statements below and describe the policy enforced by the assertion\_Policy.

```
Create table Employee (  
ID integer unique,  
salary integer,  
dept# integer)  
  
Create table Department (  
dept# integer unique,  
salaryMax integer)  
  
Create assertion_Policy check (  
  Not exists (select *  
                From Employee, Department  
                Where Employee.dept# = Department. dept#  
                And Employee.salary > Department.salaryMax))
```

(2 marks)

**Answer:**

The above trigger states that after any insertion or update on the Employee or the Department table, there should not be any employee having a salary greater than the salary max in the corresponding department of the employee.

16. State **TWO (2)** purpose of using Triggers in SQL

(2 marks)

**Answer:**

- *Validating input data and maintaining complex integrity constraints that otherwise would be difficult/impossible.*
- *Supporting alerts.*
- *Maintaining audit information.*
- *Supporting replication*

17. Database Administrator or owner of the database can provide or remove privileges on a database object to enforce security by using **Grant** and **Revoke** command. Based on the following authorization requirements, write the correct SQL command to fulfill the stated requirements.

- a) Give DELETE, INSERT, SELECT, and UPDATE privileges on the table BONUS to the user Michael.

`GRANT ALL ON bonus TO Michael;`      **[2 marks]**

- b) Give SELECT and UPDATE privileges on the view REPORTS to all users by granting the privileges to the role PUBLIC:

`GRANT SELECT, UPDATE ON reports TO public;`      **[2 marks]**

- c) Provide statement to withdraw the UPDATE privilege on REPORTS from all users:

`REVOKE UPDATE ON reports FROM public;`      **[2 marks]**

18. What happened to the database when:

- a) Transaction is committed?

A COMMIT statement ends the transaction successfully, making the database changes permanent.

**(1 mark)**

- b) Transaction is aborted?

A ROLLBACK statement aborts the transaction, backing out any changes made by the transaction.

**(1 mark)**

19. What does **ATOMICITY** property of a transaction means?

Atomicity requires that all operations of a transaction be completed; if not, the transaction is aborted.

**(1 mark)**



## SECTION B (40 MARKS)

1. Read the following case study:

*Chef's Cafe* is a food catering company that offers food delivery. The manager intends to develop an order management system to enhance their food order and delivery process. The food and beverages items are recognized by `item_ID`, `item_name`, `description` and `unit_price`.

A customer can request for price details online. Each order is submitted by one customer. However, a customer may not submit any orders. The attributes for customer are identified as `customerID`, `customer_name`, `customer_address` and `contact_number`. Note that any items sold by the company may not be requested on any order, or may get requested on one or more orders.

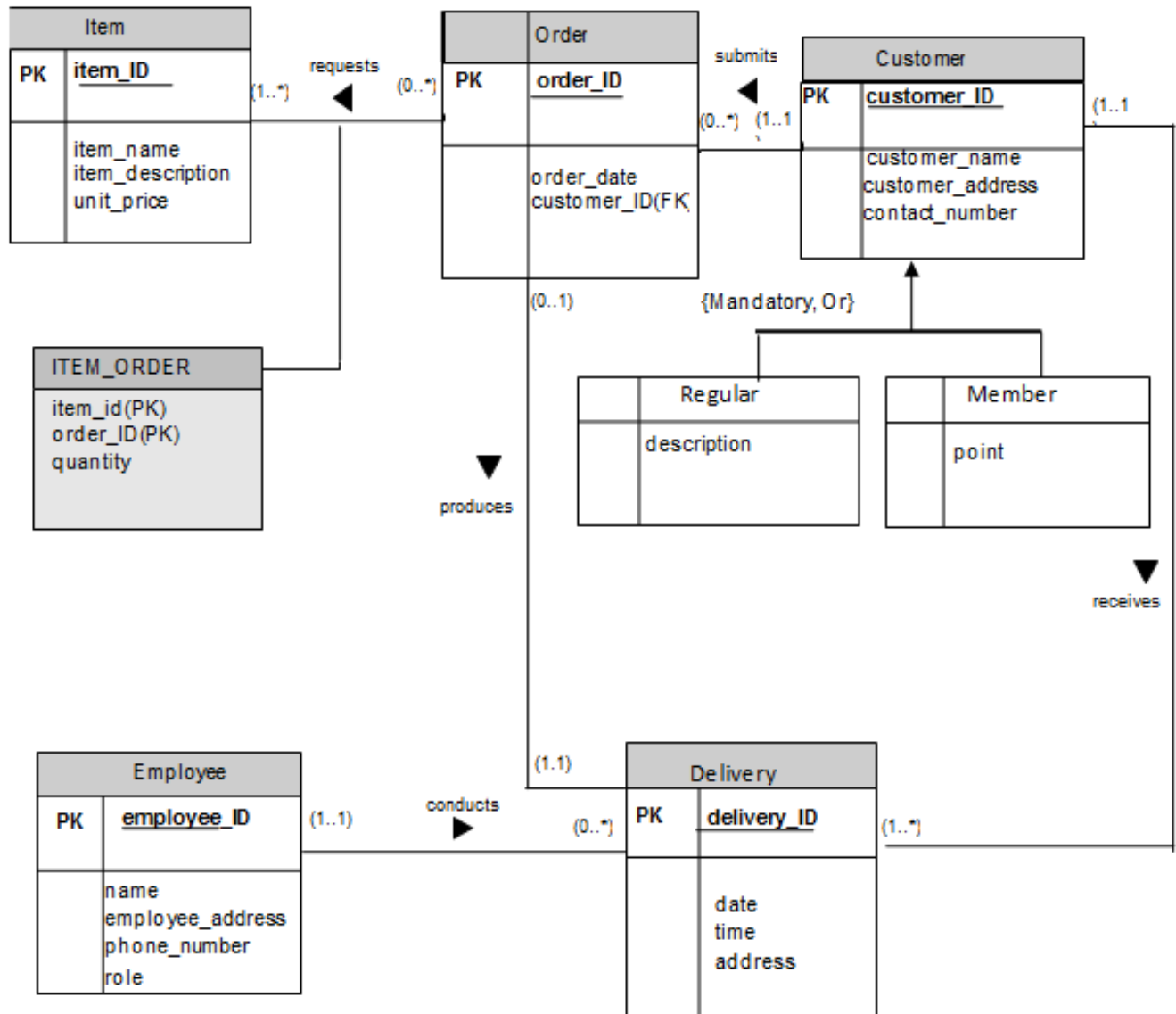
Order details are associated with `order_ID` and `order_date`, and an attribute associated with each order and item is quantity, or the number of units requested. Customers are categorized into two groups consist of regular and member customers. Points are given only to member customers based on the total of each purchase. One customer could receive more than one delivery depending on the orders or purchase of items.

*Chef's Cafe* has over 50 employees. The attributes for employee are `employee_ID`, `name`, `employee_address`, `phone_number` and `role`. Each order should produce one delivery, but any sale or delivery produced by the company may not be requested on any order. Each delivery is conducted by one employee. Delivery details include the `delivery_ID`, `date`, `time`, and `address` of the delivery.

Draw an **Enhanced Entity Relationship (EER) diagram** for conceptual data model based on requirements above. Make sure you clearly state the relation name, attribute (at least three), multiplicity, primary key, specialization or generalization and participation constraints. Steps and documentation for the diagram must strictly follow **Unified Modelling Language (UML)** notation. State any assumptions necessary to support your design.

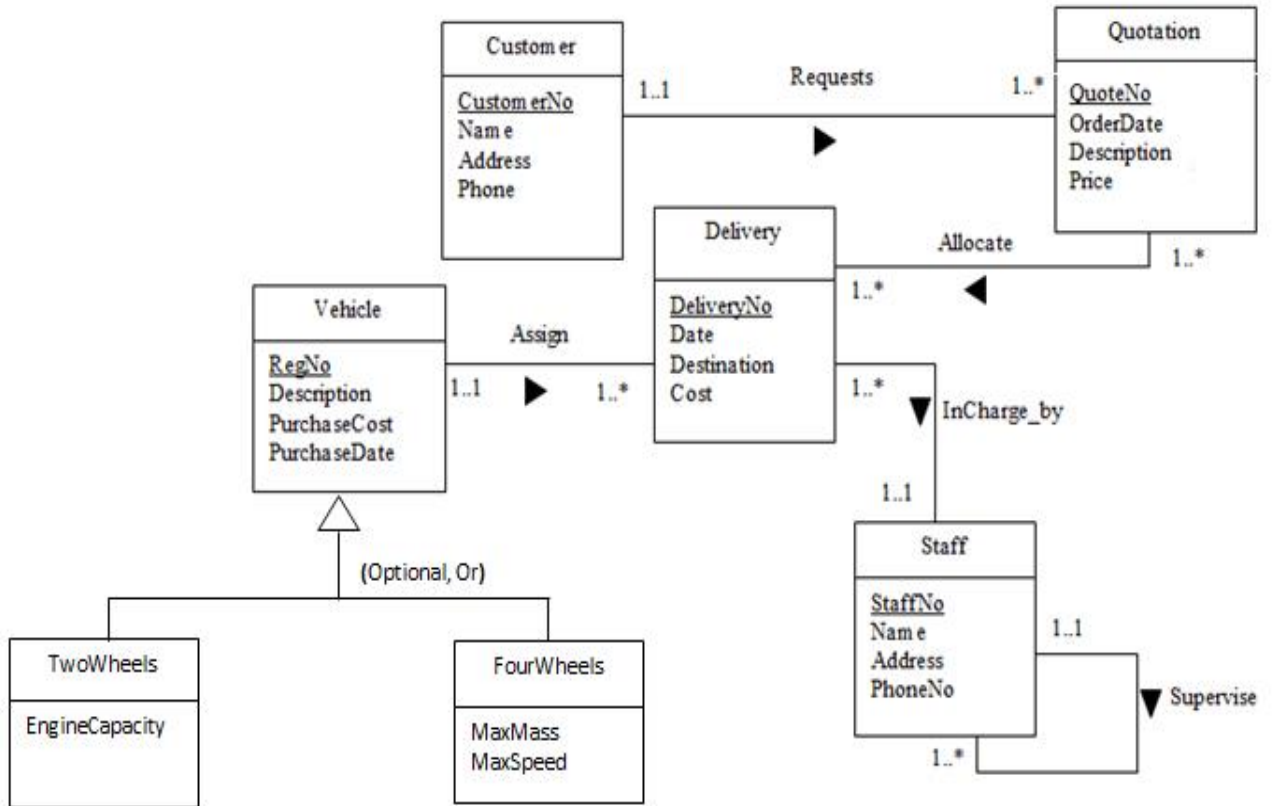
**(10 marks)**

ANSWER:



2. Map the following Enhance Entity Relationship (EER) diagram into Database Relational Model.

(10 marks)



ANSWER:

1. Customer (CustomerNo, Name, Address, Phone)  
PRIMARY KEY CustomerNo
2. Quotation (QuoteNo, OrderDate, Description, Price, *CustomerNo*)  
PRIMARY KEY QuoteNo  
Foreign Key *CustomerNo* REFERENCES Customer (*CustomerNo*)
3. Delivery (DeliveryNo, Date, Destination, Cost, *StaffNo*, *RegNo*)  
PRIMARY KEY DeliveryNo  
Foreign Key *StaffNo* REFERENCES Staff (*StaffNo*)  
Foreign Key *RegNo* REFERENCES Vehicle (*RegNo*)
4. Staff (staffNo, Name, Address, PhoneNo, *supervisorid*)  
PRIMARY KEY StaffNo
5. Allocate (QuoteNo, DeliveryNo)  
PRIMARY KEY QuoteNo, DeliveryNo  
Foreign Key QuoteNo REFERENCES Quotation (QuoteNo)  
Foreign Key DeliveryNo REFERENCES Delivery (DeliveryNo)
6. Vehicle (RegNo, Description, PurchaseCost, PurchaseDate)  
PRIMARY KEY RegNo
7. TwoWheelVehicle(RegNo, Description, PurchaseCost, PurchaseDate, EngineCapacity)  
PRIMARY KEY RegNo
8. FourWheelVehicle(RegNo, Description, PurchaseCost, PurchaseDate, MaxMass, MaxSpeed)  
PRIMARY KEY RegNo

3. Examine the following Customer History Form:

DarulAman Art Gallery		Customer History Form	
CUSTOMER:	Nur Amalina bt. Zainudin No. 3828 A, Lebuhraya Sultan Abd Halim, 05400, Alor Setar, Kedah.	Phone (012) 439-9374	
Item Purchase(s):			
Artist	Title	Purchase Date	Sales Price
04 – Latif Maulana	The Forgotten Heritage IV	09/01/2015	7500.00
13 – Satria Ulung	Seaside Villages	05/03/2015	1800.00
05 – Pak Said	Portrait of Coconut Tree	02/07/2015	4550.00
13 – Satria Ulung	Seaside Villages	07/10/2015	2800.00

The DarulAman Art Gallery wishes to maintain data on their customers, artists and paintings. They may have several paintings by each artist in the gallery at one time. Each artist is given a **unique id** and each painting is assigned a unique **art code**. Paintings may be bought and sold several times. In other words, the gallery may sell a painting, then buy it back at a later date and sell it to another customer.

Based on the form and business constraints given, perform the process of normalization from **UNF** until **3NF**.

## Answer

### **UNF (Contain repeating group such as item purchase repeat for each customer)**

custNo, custName, custAddr, custPhone, artistID, artistName, artCode, artTitle, purchaseDate, price

### **INF (Remove Repeating Group and identify all keys)**

custNo, custName, custAddr, custPhone, artistID, artistName, artCode, artTitle, purchaseDate, price [2 mark]

### **Keys:**

custNo

custNo, artCode, purchaseDate

artCode

*[Remark: the key chosen for the repeating group is the piece of art itself (artCode), however because a piece of art may be bought by a customer more than once, the purchase date was added as part of the key to make the rows unique]*

### **2NF (Remove partial dependency)**

custNo → custName, custAddr, custPhone

custNo, artCode, purchaseDate → price

artCode → artTitle, artistID, artistName

### **3NF (Remove transitive dependency, where artistName dependent with artisID)**

custNo → custName, custAddr, custPhone

custNo, artCode, purchaseDate → price

artCode → artTitle, artistID

artistID → artistName

Thus, the final tables are:

**CUSTOMER** (custNo, custName, custAddr, custPhone)

**CUSTOMER\_ART** (custNo, artCode, purchaseDate, price)

**ART** (artCode, artTitle, artistID)

**ARTIST** (artistID, artistName)

4. The followings are information in two database relations

**Salesman (salesman\_id, name, city, commission)**  
**Customer (customer\_id, cust\_name, city, salesman\_id, purch\_amount)**

Write SQL command to perform the following:

a) List commission for all salesman, arranged in descending order of commission.

**(2 marks)**

```
SELECT salesman_id, name, city, commission
FROM Salesman
ORDER BY commission DESC;
```

b) Calculate Average commission of a salesman.

**(2 marks)**

```
SELECT AVG (commission)
FROM salesman;
```

c) *Compute Highest purchase amount for each customer according to their city.*

**(2 marks)**

```
SELECT MAX (purch_amount)
FROM CUSTOMERS
GROUP BY city;
```

d) List Customers' name and salesmen's name who lives in the same city.

**(4 marks)**

```
SELECT Customer.cust_name, Salesman.name, Salesman.city
FROM Salesman, Customer
WHERE Salesman.city = Customer.city;
```

**END OF QUESTIONS**