



Princess Sumaya جامعة  
University الأميرة سميرة  
for Technology للتكنولوجيا

**Database Systems (CS11323)**  
**Mid-Term Exam, Spring 2025/2026**  
**Saturday 18<sup>th</sup> April 2026**

**Student ID:**..... **Name(بالعربي):**.....

**Select Your Section**

Instructor	Schedule	Select
Dr. Nailah Almadi	Sun, Tues, Thu 8:00 - 9:00	
	Sun, Tues, Thu 10:00 - 11:00	
	Mon, Wed 09:30 - 11:00	
Ms. Omimah Ismail	Sun, Tues, Thu 11:00 - 12:00	
	Mon, Wed 12:30 - 14:00	

**Course Learning Outcomes**

1. Explain basic data management concepts (@1) (#K)
2. Design a database system using the entity-relationship diagram (ERD) and the Enhanced entity-relationship diagram (EER) (@2) (#S)
3. Describe the basic concepts of the relational data model, tables and relational algebra (@1) (#K)
4. Apply the normalization process to relational databases (@2) (#S)
5. Use the Structured Query Language (SQL) to create, manipulate and query a database system (@2) (#S)

Question	CLO	Points	Score
1	1	10	
2	2	5	
3	2	5	
4	3	5	
5	3	5	
Total		30	

**Form B**

## Question 1: Choose the best option below

(10 points)

**1. A data model is:**

- A. A set of concepts used to describe database structure
- B. A set of rules to store data physically
- C. A programming interface
- D. A network protocol

**2. Which schema level describes physical storage structures?**

- A. Internal schema
- B. Logical schema
- C. External schema
- D. Conceptual schema

**3. Physical data independence means:**

- A. Changing queries
- B. Changing user interface
- C. Changing conceptual schema only
- D. Changing internal schema without affecting conceptual schema

**4. Which of the following best describes data?**

- A. Hardware components
- B. Database schemas
- C. Computer programs
- D. Facts that can be recorded and have meaning

**5. A relationship is**

- A. An item in an application
- B. A meaningful dependency between entities
- C. A collection of related entities
- D. Related data

**6. The weak entity is an entity that has:**

- A. No attributes
- B. No key attribute
- C. No relationships
- D. A composite attribute

**7. The Is-A relationship is shown in ER diagram using:**

- A) Recursive relationship
- B) class-subclass relationship
- C) 1:N with total participation relationship.
- D) ER cannot show this type of relationships.

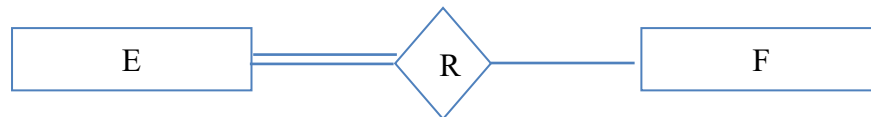
8. What statement is not true regarding inheritance in a generalization hierarchy?

- A) The attributes of the supertype apply to all of the subtypes
- B) Every subtype entity is also a supertype entity
- C) Attributes inherited from a supertype are not shown in an ERD
- D) None of the above

9. The primary key of a table is chosen among:

- A) All attributes
- B) All superkeys
- C) All combinations of all attributes
- D) All candidate keys

10. The following E/R diagram describes what kind of relationship between entities E and F?



- A) every E entity example and not all F entity examples are participating in R
- B) some E entities example and all F entity examples are participating in R
- C) every E entity example and all F entity examples are participating in R
- D) some E entities example and not all F entity examples are participating in R

Fill the answer to question one in capital letters only

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10

## Question 2: Draw the ER Diagram based on the following (5 points)

A smart home company wants to design a database:

For each **device**, store:

- Device ID (unique)
- Device name
- Type (sensor, camera, thermostat) only one allowed.
- Installation date (day, month, year)

Each device includes multiple **features**, and each feature belongs to one device.

For each **feature**, store:

- Feature ID (unique)
- Name
- Description
- Functions (multiple functions such as monitoring, alerting, controlling) each function has two information (type and status)

Each feature generates multiple **logs**, where a log **cannot exist without its feature**.

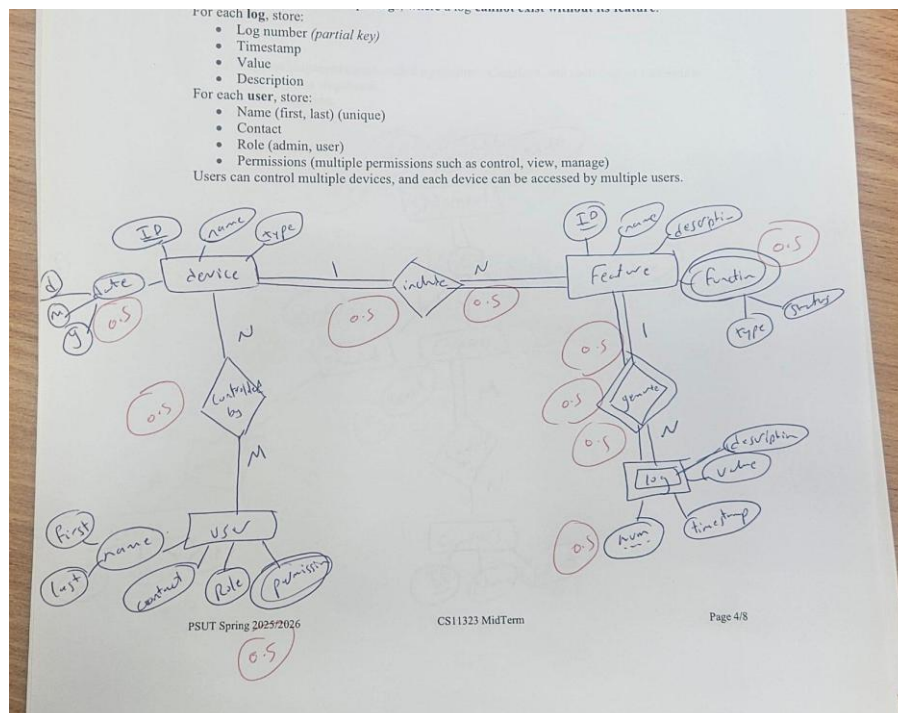
For each **log**, store:

- Log number (*partial key*)
- Timestamp
- Value
- Description

For each **user**, store:

- Name (first, last) (unique)
- Contact
- Role (admin, user)
- Permissions (multiple permissions such as control, view, manage)

Users can control multiple devices, and each device can be accessed by multiple users.



### **Question 3: Draw a complete EER diagram**

**(5 points)**

A logistics company tracks **Shipments**, each described by:

- ShipmentID
- Weight
- Destination

Shipments are categorized into:

- **StandardShipment** with DeliveryTime
- **ExpressShipment** with PriorityLevel
- **InternationalShipment** with CustomsStatus

A Shipment must belong to **one or more** of these categories.

1. **StandardShipments** are assigned to multiple **DeliveryRoutes**, and each delivery route can include many standard shipments.

For each **DeliveryRoute**, store:

- RouteID (unique)
- RouteName
- Distance

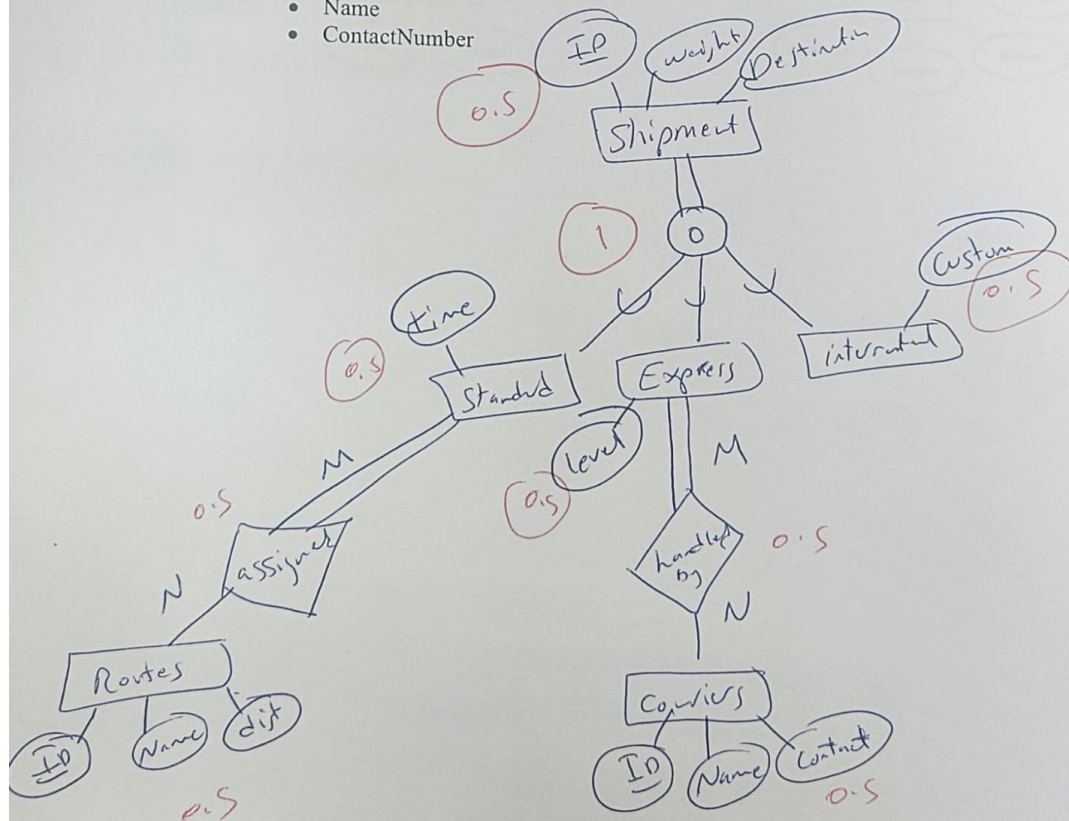
2. **ExpressShipments** are handled by multiple **Couriers**, and each courier can handle many express shipments.

For each **Courier**, store:

- CourierID (unique)
- Name
- ContactNumber

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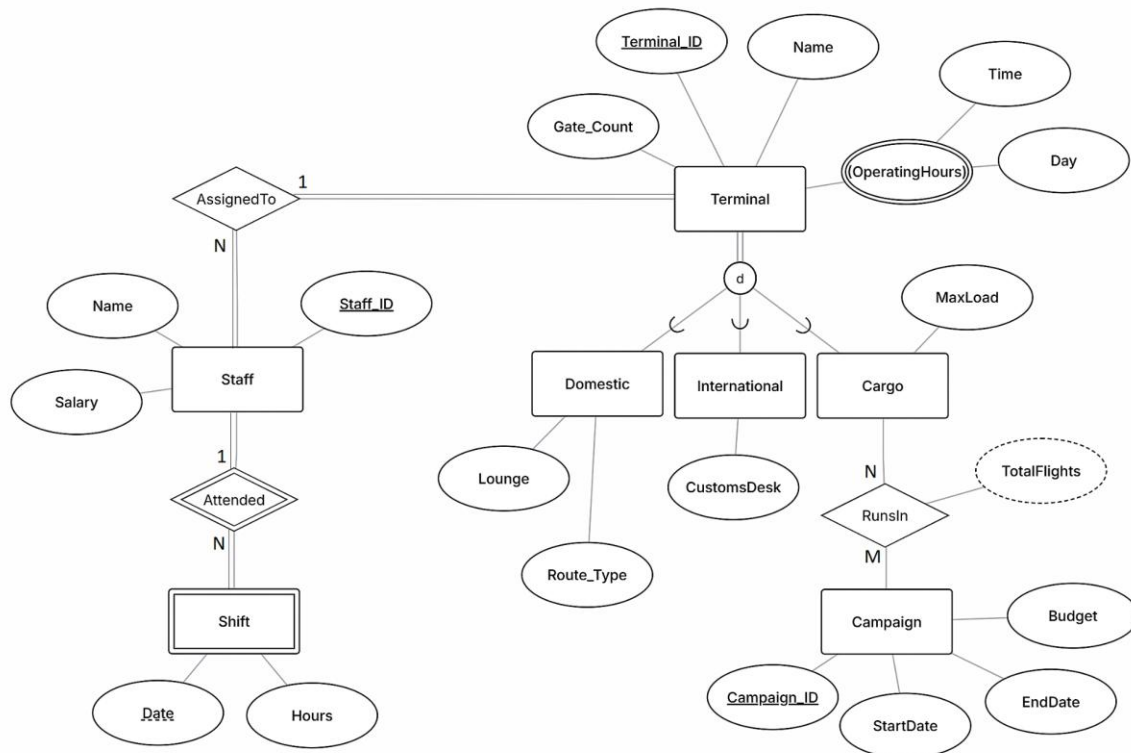


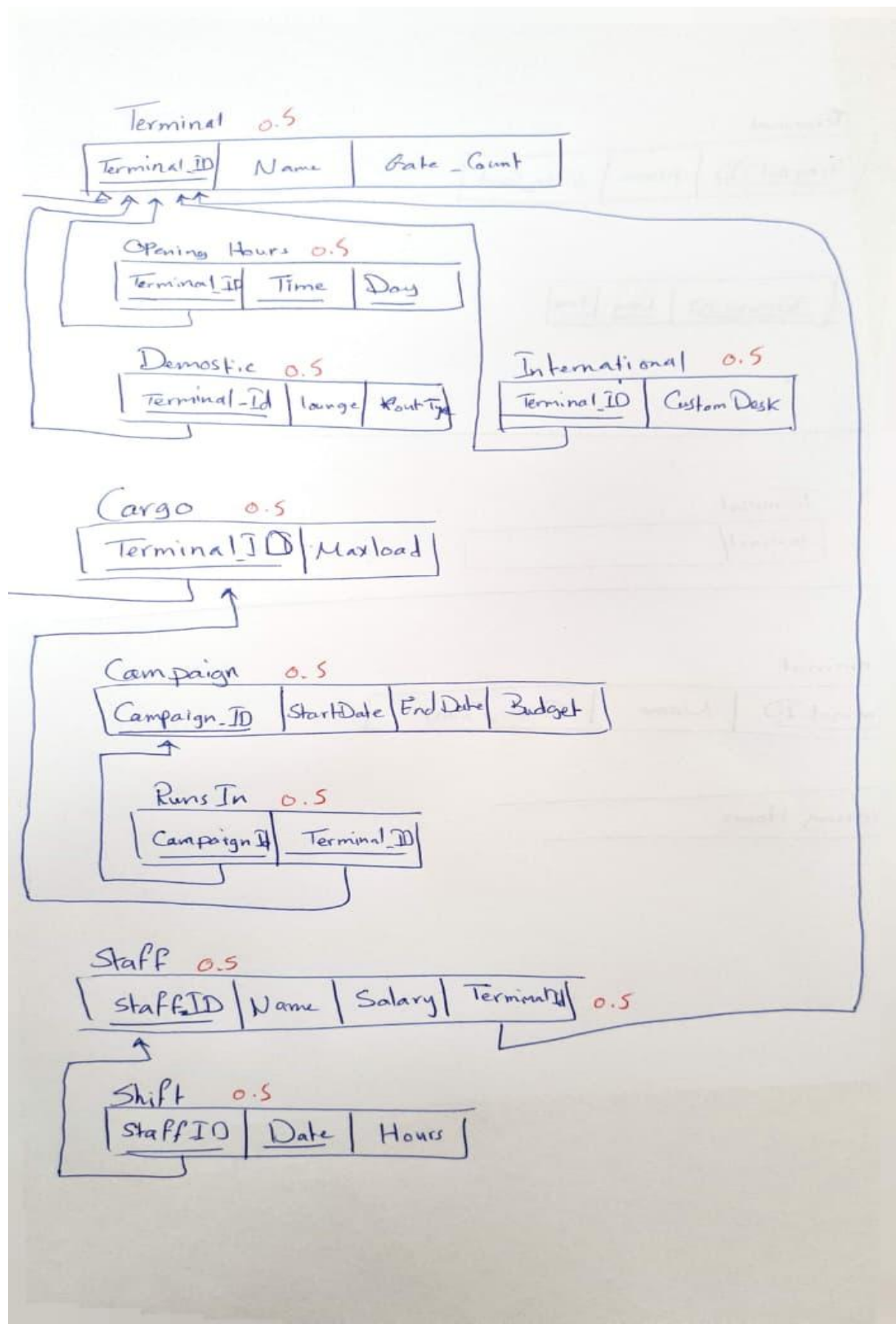
#### Question 4: Mapping ER/ EER into Relational Model

(5 Points)

Map the following ER/EER diagram into a relational schema.

Note: Use **Option A** to map the specialization/generalization.





### Question 5: Relational Model

(5 Points)



Given the following statements, write which one is acceptable, which one violates relational model constraints, and which explain why?

**Waiter**

<u>WaiterID</u>	Name	Shift	HireDate
1	Ahmad	Morning	2022-01-10
2	Salma	Evening	2023-03-15

**MenuItem**

<u>ItemID</u>	ItemName	Price	Category
10	Burger	6.5	Main
11	Pizza	8.0	Main
13	Salad	4.0	Starter

**Order**

<u>OrderID</u>	WaiterID (FK)	OrderDate
100	1	2026-04-10
101	2	2026-04-10
102	1	2026-04-11

**OrderItem**

<u>OrderID (FK)</u>	<u>ItemID (FK)</u>	Quantity
100	10	1
100	12	2
101	11	1
102	10	1

Statement	Acceptable? (Yes/No)	Constraint violated (if any)
Insert the following values into the OrderItem table <100, 10, 5>	No	PK
Insert the following values into the OrderItem table <120, NULL, NULL>	No	Entity integrity/ FK
Insert the following values into the Order table <100, 3, 2-2-2026 >	No	FK/ PK
Insert the following values into the MenuItem table < 'Rice, 12, 2.5, 'Main'>	No	Domain
Insert the following values into the Order table <300, NULL, NULL>	Yes	