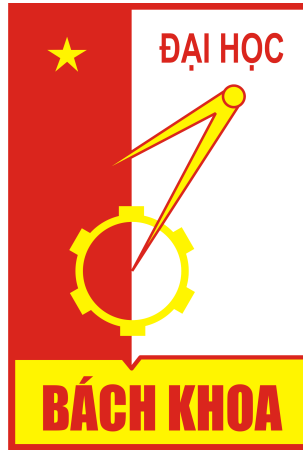HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

ITSS SOFTWARE DEVELOPMENT - IT4549E

GROUP HOMEWORK REPORT
WEEK 08: DATA MODELING

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Contents

1   Introduction

This report presents the **data modeling** task for **AIMS** system.

Chapter 2 includes the Entity-Relationship Diagram (ERD), the Relational Schema (RS), and table specifications for the system. Chapter 3 provides the full SQL script for schema creation, including constraints and relationships.

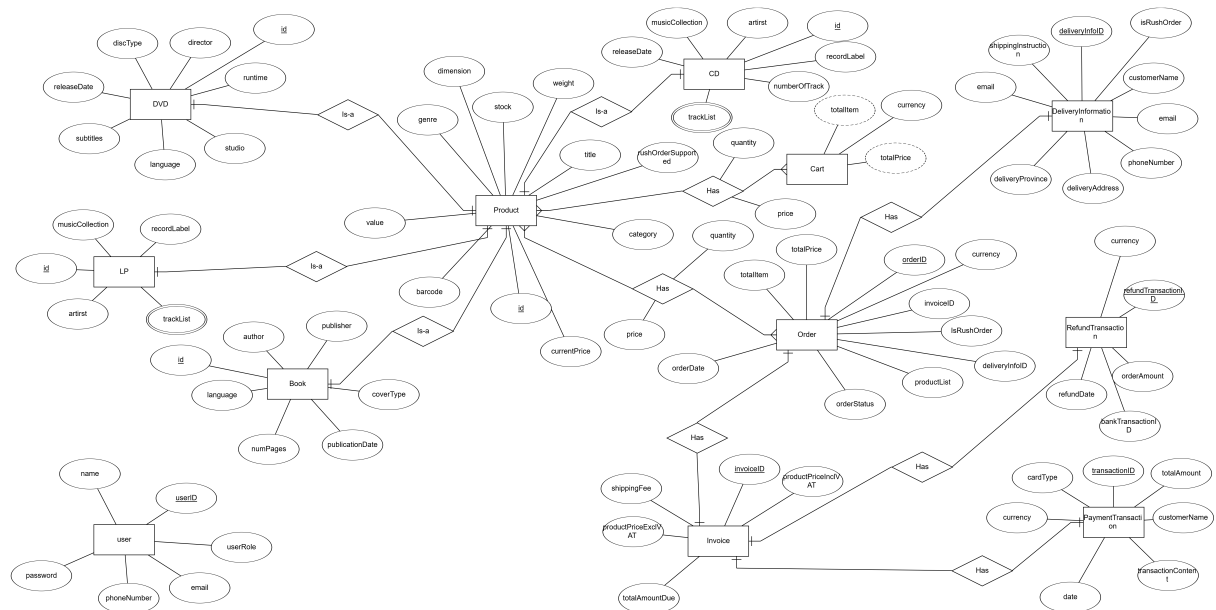# 2   Data Modeling

2.1   Entity-Relationship Diagram (ERD)

Figure 1: AIMS's ERD

2.2 Relational Schema (RS)

Figure 2: AIMS's Relational Schema

2.3 Table Specification

2.3.1 User

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		userID	Integer	Yes	Unique identifier for user
2.			name	VARCHAR(100)	Yes	User's full name
3.			email	VARCHAR(100)	Yes	User's email address
4.			password	VARCHAR(32)	Yes	User's password (hashed)
5.			phoneNumber	CHAR(10)	Yes	User's phone number
6.			userRole	VARCHAR(50)	Yes	Role of user (admin or productManager)

Table 1: User

2.3.2 Product

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		id	Integer	Yes	Unique identifier for product
2.			title	VARCHAR(255)	Yes	Title of the product
3.			genre	VARCHAR(100)	No	Genre of the product
4.			dimension	VARCHAR(50)	Yes	Physical dimensions of the product
5.			weight	NUMERIC(10,2)	Yes	Weight of the product
6.			stock	Integer	Yes	Available quantity in inventory
7.			barcode	VARCHAR(100)	Yes	Product barcode
8.			currentPrice	Integer	Yes	Current selling price
9.			rushOrderSupported	Boolean	Yes	Indicates if rush order is available
10.			value	Integer	Yes	Product value
11.			category	VARCHAR(20)	Yes	Category (book, lp, cd, dvd)

Table 2: Product

2.3.3 CD

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x	x	id	Integer	Yes	ID, same as ID of Product of which type is CD
2.			releaseDate	DATE	No	Release date of the CD
3.			musicCollection	VARCHAR(255)	Yes	Album or collection name
4.			artist	VARCHAR(100)	Yes	Artist's name
5.			totalTrack	Integer	No	Total number of tracks
6.			recordLabel	VARCHAR(100)	Yes	Record label name

Table 3: CD

2.3.4 DVD

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x	x	id	Integer	Yes	ID, same as ID of Product of which type is DVD
2.			releaseDate	DATE	No	Release date of the DVD
3.			subtitles	VARCHAR(255)	Yes	Available subtitles on the DVD
4.			language	VARCHAR(50)	Yes	Audio language of the DVD
5.			studio	VARCHAR(100)	Yes	Production studio
6.			runtime	Integer	Yes	Runtime in minutes
7.			director	VARCHAR(100)	Yes	Name of the director
8.			discType	VARCHAR(50)	Yes	Type of DVD disc (e.g. Blu-ray, 4K)

Table 4: DVD

2.3.5 CDTrack

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		trackID	Integer	Yes	Unique identifier for CD track
2.		x	cdID	Integer	Yes	Reference to CD table
3.			trackNo	Integer	No	Track number on the CD
4.			title	VARCHAR(255)	Yes	Title of the track

Table 5: CDTrack

2.3.6 LP

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x	x	id	Integer	Yes	ID, same as ID of Product of which type is LP
2.			releaseDate	DATE	No	Release date of the LP
3.			musicCollection	VARCHAR(255)	Yes	Album or collection name
4.			artist	VARCHAR(100)	Yes	Artist's name
5.			totalTrack	Integer	No	Total number of tracks
6.			recordLabel	VARCHAR(100)	Yes	Record label name

Table 6: LP

2.3.7 LPTrack

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		trackID	Integer	Yes	Unique identifier for LP track
2.		x	lpID	Integer	Yes	Reference to LP table
3.			trackNo	Integer	No	Track number on the LP
4.			title	VARCHAR(255)	Yes	Title of the track

Table 7: LPTrack

2.3.8 Book

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x	x	id	Integer	Yes	ID, same as ID of Product of which type is Book
2.			author	VARCHAR(100)	Yes	Author's name
3.			publisher	VARCHAR(100)	Yes	Publisher's name
4.			coverType	VARCHAR(50)	Yes	Type of book cover (e.g. hard-cover, paperback)
5.			publicationDate	DATE	Yes	Date of publication
6.			numPages	Integer	No	Number of pages
7.			language	VARCHAR(50)	No	Language of the book

Table 8: Book

2.3.9 Orders

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		orderID	Integer	Yes	Unique identifier for order
2.			totalItem	Integer	Yes	Total number of items in the order
3.			totalPrice	Integer	Yes	Total price of the order
4.			currency	VARCHAR(10)	Yes	Currency (default: VND)
5.		x	invoiceID	Integer	No	Reference to Invoice table
6.		x	deliveryInfoID	Integer	No	Reference to DeliveryInformation table
7.			orderDate	DATE	Yes	Date when order was placed
8.			orderStatus	VARCHAR(50)	Yes	Status of order (default: new)
9.			isRushOrder	Boolean	Yes	Indicates if it's a rush order

Table 9: Orders

2.3.10 OrderItem

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x	x	orderID	Integer	Yes	Part of composite PK, reference to Orders table
2.	x	x	productID	Integer	Yes	Part of composite PK, reference to Product table
3.			quantity	Integer	Yes	Quantity of product ordered
4.			price	Integer	Yes	Price of product at time of order

Table 10: OrderItem

2.3.11 DeliveryInformation

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		deliveryInfoID	Integer	Yes	Unique identifier for delivery information
2.			customerName	VARCHAR(100)	Yes	Name of the customer
3.			email	VARCHAR(100)	Yes	Email address for delivery notifications
4.			phoneNumber	VARCHAR(20)	Yes	Contact phone number
5.			deliveryAddress	TEXT	Yes	Delivery address
6.			deliveryProvince	VARCHAR(50)	Yes	Province/state for delivery
7.			shippingInstruction	TEXT	No	Special instructions for shipping
8.			isRushOrder	Boolean	Yes	Indicates if it's a rush delivery

Table 11: DeliveryInformation

2.3.12 Invoice

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		invoiceID	Integer	Yes	Unique identifier for invoice
2.			productPriceExVAT	Integer	Yes	Product price excluding VAT
3.			productPriceIncVAT	Integer	Yes	Product price including VAT
4.			shippingFee	Integer	Yes	Shipping fee
5.			totalAmountDue	Integer	Yes	Total amount due
6.		x	transactionID	Integer	No	Reference to PaymentTransaction table
7.		x	refundTransactionID	Integer	No	Reference to RefundTransaction table

Table 12: Invoice

2.3.13 PaymentTransaction

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		transactionID	Integer	Yes	Unique identifier for payment transaction
2.			customerName	VARCHAR(100)	Yes	Name on the payment card/account
3.			cardType	VARCHAR(50)	Yes	Type of payment card used
4.			transactionContent	TEXT	Yes	Details of the transaction
5.			totalAmount	Integer	Yes	Total amount of payment
6.			currency	VARCHAR(10)	Yes	Currency of payment
7.			date	DATE	Yes	Date of payment transaction
8.			bankTransactionID	VARCHAR(100)	Yes	Bank's transaction reference

Table 13: PaymentTransaction

2.3.14 RefundTransaction

#	PK	FK	Column Name	Data type	Mandatory	Description
1.	x		refundTransactionID	Integer	Yes	Unique identifier for refund transaction
2.			refundDate	DATE	Yes	Date of refund
3.			orderAmount	Integer	Yes	Amount being refunded
4.			bankTransactionID	VARCHAR(100)	Yes	Bank's transaction reference
5.			currency	VARCHAR(10)	Yes	Currency of refund

Table 14: RefundTransaction

3 SQL Script

```sql
CREATE TABLE "User" (
  "userID" int PRIMARY KEY,
  "name" varchar(100) NOT NULL,
  "email" varchar(100) NOT NULL,
  "password" varchar(32) NOT NULL,
  "phoneNumber" char(10) NOT NULL,
  "userRole" varchar(50) NOT NULL
);

CREATE TABLE "Product" (
  "id" int PRIMARY KEY,
  "title" varchar(255) NOT NULL,
  "genre" varchar(100),
  "dimension" varchar(50) NOT NULL,
  "weight" numeric(10,2) NOT NULL,
  "stock" int NOT NULL,
  "barcode" varchar(100) NOT NULL,
  "currentPrice" int NOT NULL,
  "rushOrderSupported" boolean NOT NULL,
  "value" int NOT NULL,
  "category" varchar(20) NOT NULL
);

CREATE TABLE "DVD" (
  "id" int PRIMARY KEY,
  "releaseDate" date,
  "subtitles" varchar(255) NOT NULL,
  "language" varchar(50) NOT NULL,
  "studio" varchar(100) NOT NULL,
  "runtime" int NOT NULL,
  "director" varchar(100) NOT NULL,
  "discType" varchar(50) NOT NULL
);
```

```sql
CREATE TABLE "CD" (
  "id" int PRIMARY KEY,
  "releaseDate" date,
  "musicCollection" varchar(255) NOT NULL,
  "artist" varchar(100) NOT NULL,
  "totalTrack" int,
  "recordLabel" varchar(100) NOT NULL
);

CREATE TABLE "CDTrack" (
  "trackID" int PRIMARY KEY NOT NULL,
  "cdID" int NOT NULL,
  "trackNo" int,
  "title" varchar(255) NOT NULL
);

CREATE TABLE "LPTrack" (
  "trackID" int PRIMARY KEY NOT NULL,
  "lpID" int NOT NULL,
  "trackNo" int,
  "title" varchar(255) NOT NULL
);

CREATE TABLE "LP" (
  "id" int PRIMARY KEY,
  "releaseDate" date,
  "musicCollection" varchar(255) NOT NULL,
  "artist" varchar(100) NOT NULL,
  "totalTrack" int,
  "recordLabel" varchar(100) NOT NULL
);

CREATE TABLE "Book" (
  "id" int PRIMARY KEY,
  "author" varchar(100) NOT NULL,
  "publisher" varchar(100) NOT NULL,
  "coverType" varchar(50) NOT NULL,
  "publicationDate" date NOT NULL,
  "numPages" int,
  "language" varchar(50)
);

CREATE TABLE "Orders" (
  "orderID" int PRIMARY KEY,
  "totalItem" int NOT NULL,
  "totalPrice" int NOT NULL,
  "currency" varchar(10) NOT NULL DEFAULT 'VND',
  "invoiceID" int,
  "deliveryInfoID" int,
  "orderDate" date NOT NULL,
  "orderStatus" varchar(50) NOT NULL DEFAULT 'new',
  "isRushOrder" boolean NOT NULL
);

CREATE TABLE "OrderItem" (
  "orderID" int,
```

```sql
  "productID" int,
  "quantity" int NOT NULL,
  "price" int NOT NULL,
  PRIMARY KEY ("orderID", "productID")
);

CREATE TABLE "DeliveryInformation" (
  "deliveryInfoID" int PRIMARY KEY,
  "customerName" varchar(100) NOT NULL,
  "email" varchar(100) NOT NULL,
  "phoneNumber" varchar(20) NOT NULL,
  "deliveryAddress" text NOT NULL,
  "deliveryProvince" varchar(50) NOT NULL,
  "shippingInstruction" text,
  "isRushOrder" boolean NOT NULL
);

CREATE TABLE "Invoice" (
  "invoiceID" int PRIMARY KEY,
  "productPriceExVAT" int NOT NULL,
  "productPriceIncVAT" int NOT NULL,
  "shippingFee" int NOT NULL,
  "totalAmountDue" int NOT NULL,
  "transactionID" int UNIQUE,
  "refundTransactionID" int UNIQUE
);

CREATE TABLE "PaymentTransaction" (
  "transactionID" int PRIMARY KEY,
  "customerName" varchar(100) NOT NULL,
  "cardType" varchar(50) NOT NULL,
  "transactionContent" text NOT NULL,
  "totalAmount" int NOT NULL,
  "currency" varchar(10) NOT NULL,
  "date" date NOT NULL,
  "bankTransactionID" varchar(100) NOT NULL
);

CREATE TABLE "RefundTransaction" (
  "refundTransactionID" int PRIMARY KEY,
  "refundDate" date NOT NULL,
  "orderAmount" int NOT NULL,
  "bankTransactionID" varchar(100) NOT NULL,
  "currency" varchar(10) NOT NULL
);

COMMENT ON COLUMN "User"."userRole" IS 'admin or productManager';
COMMENT ON COLUMN "Product"."category" IS 'book, lp, cd, dvd';
COMMENT ON COLUMN "Orders"."orderStatus" IS 'new, pending, approved,
    delivered, rejectedNotRefunded, refunded, canceled';
COMMENT ON TABLE "OrderItem" IS 'Composite primary key (orderID,
    productID)';

ALTER TABLE "DVD" ADD FOREIGN KEY ("id") REFERENCES "Product" ("id");
ALTER TABLE "CD" ADD FOREIGN KEY ("id") REFERENCES "Product" ("id");
ALTER TABLE "CDTrack" ADD FOREIGN KEY ("cdID") REFERENCES "CD" ("id");
```

```
ALTER TABLE "LPTrack" ADD FOREIGN KEY ("lpID") REFERENCES "LP" ("id");
ALTER TABLE "LP" ADD FOREIGN KEY ("id") REFERENCES "Product" ("id");
ALTER TABLE "Book" ADD FOREIGN KEY ("id") REFERENCES "Product" ("id");
ALTER TABLE "Orders" ADD FOREIGN KEY ("invoiceID") REFERENCES "Invoice"
    ("invoiceID");
ALTER TABLE "Orders" ADD FOREIGN KEY ("deliveryInfoID") REFERENCES "
    DeliveryInformation" ("deliveryInfoID");
ALTER TABLE "OrderItem" ADD FOREIGN KEY ("orderID") REFERENCES "Orders"
    ("orderID");
ALTER TABLE "OrderItem" ADD FOREIGN KEY ("productID") REFERENCES "
    Product" ("id");
ALTER TABLE "Invoice" ADD FOREIGN KEY ("transactionID") REFERENCES "
    PaymentTransaction" ("transactionID");
ALTER TABLE "Invoice" ADD FOREIGN KEY ("refundTransactionID") REFERENCES
     "RefundTransaction" ("refundTransactionID");
```

References