

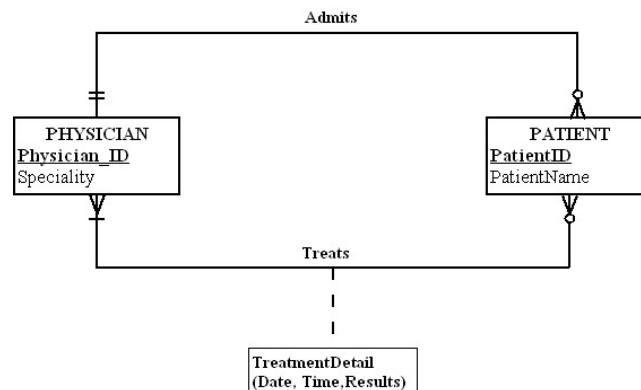
**HKU Business School**  
**MSBA7024 Database Design and Management**  
**Review for Written Exam**  
**January 22, 2024 (Monday) 6:30pm to 9:30pm**  
**Classrooms ABCDEFGH**

1. Use of any electronic devices is NOT allowed during the exam.
2. You are allowed to bring a piece of A4 paper (can be printed/written on both sides) as a “cheat sheet”.
3. For questions that involve drawing, you may use a pencil.
4. For questions on logical design, you are suggested (but not mandatory) to use the following format to represent a table:  
    RELATION\_NAME(Primary\_Key1, ..., Attribute1, ..., Foreign\_Key1, ...)  
instead of drawing all the boxes like what was shown in the slides.  
You are also required to draw arrows for foreign keys.

## Format and Sample Questions

The total points of the exam is 100. There will be about 6 to 8 short questions (possibly with subparts) based on what we have covered so far. This may include such tasks as mapping ER diagrams to logical design, or writing SQL or MongoDB queries. Below are some sample questions:

1. What are the disadvantages of traditional file processing systems?
2. Draw an ER diagram for a given situation (similar to Assignment 1 & Exercise 1)
3. Map the following ER diagram into relations (similar to Exercise 2)



4. Suppose a database has the following relations:
  - ORDER\_T (Order\_ID, Order\_Date, Customer\_ID, Customer\_Name, Customer\_Address)
  - PRODUCT\_T (Product\_ID, Product\_Description, Product\_Price)
  - ORDER\_LINE\_T (Order\_ID, Product\_ID, Order\_Quantity)
  - (a) Write a query to create the PRODUCT\_T table.
  - (b) Write a query to retrieve the details of all customers who have placed an order. Include the Order\_ID in the result.
  - (c) What is the purpose of the following query?  
SELECT MAX(Product\_Price) FROM PRODUCT\_T

(Some other queries similar to Assignment 2. There may also be questions similar to this for MongoDB.)

5. Suppose a database has the following relations:
  - ORDER\_T (Order\_ID, Order\_Date, Customer\_ID, Customer\_Name, Customer\_Address)
  - PRODUCT\_T (Product\_ID, Product\_Description, Product\_Price)
  - ORDER\_LINE\_T (Order\_ID, Product\_ID, Order\_Quantity)
  - (a) Are the tables in 1NF, 2NF, or 3NF?
  - (b) Convert all tables into 3NF.(similar to Exercise 3)
6. What is the CAP Theorem? What are its implications on NoSQL databases?

## Coverage

### Chapter 1: The Database Environment

- Definition of data, metadata, and database
- Issues with file processing systems
- Definition of a database management system
- Advantages and cost/risk of the database approach
- Elements of the database approach
- One-to-many/many-to-many relationships
- Components of the database environment
- Database applications
- Enterprise data model
- ~~SDLC vs Prototyping~~

### Chapter 2: ER Diagram

- Definition of business rules and good data names
- The three basic constructs for ER models
- How to choose good entities and attributes and how to represent relationships correctly
- Different types of attributes
- Characteristics of identifiers
- Degree of relationships: unary, binary, ternary
- Cardinality of relationships: one-to-one, one-to-many, many-to-many
- Multiple relationships
- Strong vs Weak entities, Associative entities
- Supertype/subtype relationships
- Entity clusters
- Action assertions in ER diagrams
- How to draw ER diagrams for common business situations using the notation in the handouts

### Chapter 3: Introduction to SQL

- Benefits of a Standardized Relational Language
- The SQL environment
- DDL, DML, DCL, and the database development process
- CREATE TABLE statements; Establish referential integrity using SQL
- ALTER TABLE and DROP TABLE statements
- CREATE INDEX statements
- INSERT, DELETE, and UPDATE statements
- ~~MERGE statements~~
- SELECT statements
- Aggregate functions and Boolean operators
- Using and defining views; pros/cons of dynamic views
- Different types of JOIN operations; multiple-table SQL queries
- Noncorrelated and correlated subqueries
- ~~CASE statements~~
- ~~Data dictionary facilities~~
- ~~Enhancements/Extensions in newer versions~~
- ~~Routines and triggers~~
- ~~SQL for Routines and triggers~~

### Chapter 4: Logical Database Design and Relational Model

- Properties of relations
- Definition of candidate keys, primary keys, foreign keys, simple keys, and composite keys.
- Different types of integrity constraints
- Transforming EER diagrams into relations:
  - Regular entities (Simple attributes, Composite attributes, Multivalued attributes)

- Weak entities
- Unary relationships, Binary relationships, Ternary relationships
- Associate entities
- Supertype/subtype relationships
- Goal of data normalization
- Types of anomalies
- Identify functional dependencies in relations; express them using arrows or diagrams
- Understand the differences between 1NF, 2NF, and 3NF and how to do normalization
- Issues to watch out in merging relations

## **Chapter 5: Physical Database Design and Performance**

## **Chapter 6: Data Warehouse**

- Purpose of data warehousing
- Characteristics of data warehouses
- Data warehouse architectures
- The ETL process
- Compare and contrast star, snowflake, and galaxy schemas
- Slowly changing dimensions
- Discuss basic OLAP operations
- Discuss the success factors for data warehouse implementation

## **Chapter 7: NoSQL Databases**

- Issues with RDBMS when used for applications nowadays
- Compare the pros and cons of RDBMS and NoSQL databases
- Discuss the key features of NoSQL models
- Discuss the major categories of NoSQL databases
- ~~Cassandra database~~
- The CAP Theorem and its implications

## **Chapter 8: MongoDB**

- The MongoDB environment
- The document model
- Understand JSON
- Write simple Javascript statements to perform read, create, update, and insert operations on a MongoDB database
- ~~Understand the basic environment of MongoDB~~
- ~~Discuss the read/write performance of MongoDB~~
- ~~Discuss the consistency provided by MongoDB~~