

A.I.S. Class 5: Outline

- Group Work for Chapters 1 & 2
- Learning Objectives for Chapter 6
- Elements of Database Systems
- Group Work for Chapter 6

Group Work for Chapters 1 & 2

- Discussion Questions Chapters 1 & 2
- Chapter 2 Problems 3, 4, 5, 7
- Narrative and flowcharts in the Chapter 1

Appendix for automated sales

Group Contracts

- Please turn in if you have not already . . .
- Most of the rest of the documentation is “just in case”
- But the last three pages are logs that you need to maintain continuously – and you must turn copies in with each stage of the project

Learning Objectives for Chapter 6

- After studying this chapter you should be able to:
 - ◆ distinguish between the file-oriented approach and the database approach
 - ◆ discuss fundamental relational database concepts such as composite and foreign keys
 - ◆ specify the types of relationships that can be represented in database systems

Learning Objectives for Chapter 6

- ◆ provide a detailed description of the relational database model
- ◆ discuss database integrity, emphasizing entity and referential integrity in particular
- ◆ explain and provide examples of validation rules in relational database systems
- ◆ discuss how views and permissions can be used to restrict access to sensitive data in relational database systems

Learning Objectives for Chapter 6

- ◆ explain the data dictionary concept
- ◆ describe the types of database languages
- ◆ construct SQL queries to extract information from relational database systems
- ◆ discuss database backup and recovery methods
- ◆ explain concepts such as concurrency control
- ◆ explain in general terms concepts such as the object-oriented approach to developing database systems

File Oriented Approach

- Data redundancy
- Proliferation of files
- Lengthy application development
- Lack of data independence
- Duplicate processing
- Data inconsistencies

Database Approach

- Data redundancy virtually eliminated
- Eliminate data inconsistencies
- Data independence
- Rapid application development
- Centralized backup, control and security
- Avoid duplicate processing

Database Approach

- Complexity
- Data integrity requires programming and knowledge of DBMS
- Data accessible only through DBMS
- Centralized backup, control and security

Database Concepts

■ Keys

- ★ Primary keys
- ★ Composite (concatenated) keys
- ★ Foreign keys
- ★ Non-key attributes

■ Cardinalities

- ★ 1:1
- ★ 1:M and M:1
- ★ M:M

Our Notation

- The textbook used to show primary keys underlined and foreign keys dotted underlined; sometimes they showed primary keys in italics and marked foreign keys with an asterisk. Now they show primary keys underlined and foreign keys with an asterisk. *We will stick to the notation shown here, with primary keys underlined and foreign keys in square brackets.*

Customer (Customer#, Name, Address, . . .)

Invoices (Invoice#, Date, [Customer#], . . .)

InvoiceItems ([Invoice#], Item#, Qty, UnitPrice)

or

Inventory (Inventory#, InventoryName, . . .)

InvoiceItems ([Invoice#], [Inventory#], Qty, UnitPrice)

Database Models

■ Hierarchical

- ◆ 1:1 and 1:M relationships (parent-child)
- ◆ single root (entry point)
- ◆ explicit pointers

■ Network

- ◆ 1:1, 1:M, M:1 and M:M relationships
- ◆ multiple parents (multiple entry points)
- ◆ explicit pointers

Database Models

■ Relational

- ◆ Relations (tables)
- ◆ Tuples (rows)
- ◆ Attributes (columns)
- ◆ Relationships between tables are *implicit*

The Relational Database Model

- Relation (table) names must be unique
- Every relation must have a primary key
- Duplicate rows and columns are not allowed
- The order of rows and columns is immaterial (except by convention)
- Entity integrity
- Referential integrity

The Relational Database Model

■ Entity integrity

- ◆ Primary key cannot be null
- ◆ Primary key must be unique

■ Referential integrity

- ★ foreign keys (when part of a composite key)
 - ◆ must match an existing value (cannot be null)
- ★ foreign keys (when non-key attributes)
 - ◆ must match an existing value or be null

Validation Rules

- Greater than minimum value
- Less than maximum value
- One of the acceptable values
- Correct number of digits
- Correct mathematical or logical relationship between fields

Restricting Access

- Specifying permissions
- Restricted logical views

Data Dictionary

- Stores information about the tables, attributes (columns), formats, access privileges etc.

RDBMS Languages

- Data Definition Language (DDL)
- Data Manipulation Language (DML)
- Data Query Language (DQL)
 - ★ Query By Example (QBE)
 - ★ Structured Query Language (SQL)
- Report writers
- Forms editors

SQL

- ```
SELECT <table_name1>.<field_name1>, <table_name2>.<field_name2> ...
FROM table_name1, table_name2, ...
WHERE
<table_name1>.<common_field1> = <table_name2>.<common_field2> ...
AND
<condition> [INTO <result table>]
```
- ```
SELECT CUSTOMERS.NAME, CUSTOMERS.BALANCE  
FROM CUSTOMERS, SALES, ITEMS_SOLD  
WHERE  
CUSTOMERS.CUSTOMERNO = SALES.CUSTOMERNO  
AND  
SALES.INVOICENO = ITEMS_SOLD.INVOICENO  
AND  
ITEMS_SOLD.ITEMNO = 1250
```

DBMS Backup and Control

- Static backup
- Dynamic backup
 - ★ Redundant Array of Independent Disks (RAID)
- Concurrency control
 - ★ lock out
 - ★ write lock

OODBMS

- Encapsulation
- Polymorphism
- Inheritance
- Currently high cost and weak performance
- Hybrid systems for the future?
 - ★ ORDBMS (Object-Relational Database Management System)
 - ★ SQL-1999

Group Work for Chapter 6

- Discussion Questions – if there are problems
- Please work on Problems 2, 5, 6, 7
- Narrative and flowcharts in the Chapter 1

Appendix for manual Purchases