IMPLEMENTASI BASIS DATA

CSH3E3 #2

Oleh : Tim Dosen KK SIDE FIF

Sub Bahasan

- Review rancangan Basis Data
- Periksa kelengkapan atribut dan ketepatan domainnya
- Periksa kembali hubungan antar tabel (Primary Key – Foreign Key)
- Memilih DBMS
- Perintah SQL CREATE TABLE
- Saatnya berlatih
- Saatnya eksplorasi

Sub Bahasan 1

- **Review rancangan Basis Data**
- **Sumber**
  - **Paradigma Terstruktur**
    DATA STORE di Data Flow Diagram ➔ Entity Relationship Diagram
    ➔ Perancangan Tabel-table Basis Data

  - **Paradigma OO**
    Class Diagram ➔ Entity Relationship Diagram
    ➔ Perancangan Tabel-table Basis Data

Periksa kembali normalisasi Basis Data

NORMAL FORM	CHARACTERISTIC
First normal form (1NF)	Table format; no repeating groups and PK identified
Second normal form (2NF)	1NF and no partial dependencies
Third normal form (3NF)	2NF and no transitive dependencies
Boyce-Codd normal form (BCNF)	Every determinant is a candidate key (special case of 3NF)
Fourth normal form (4NF)	3NF and no independent multivalued dependencies

Database Tables and Normalization

- Normalization
  - Process for evaluating and correcting table structures to minimize data redundancies
    - Reduces data anomalies
  - Works through a series of stages called normal forms:
    - First normal form (1NF)
    - Second normal form (2NF)
    - Third normal form (3NF)
  - 2NF is better than 1NF; 3NF is better than 2NF
  - For most business database design purposes, 3NF is as high as we need to go in normalization process
  - Highest level of normalization is not always most desirable

The Normalization Process

- Each table represents a single subject
- No data item will be unnecessarily stored in more than one table
- All attributes in a table are dependent on the primary key

Contoh : Ada Laporan sbb

TABLE 5.1 A Sample Report Layout

PROJ. NUM.	PROJECT NAME	EMPLOYEE NUMBER	EMPLOYEE NAME	JOB CLASS.	CHG/ HOUR	HOURS BILLED	TOTAL CHARGE
15	Evergreen	103	June E. Arbough	Elec. Engineer	$ 85.50	23.8	$ 2,011.10
		101	John G. News	Database Designer	$105.00	19.4	$ 2,037.00
		105	Alice K. Johnson*	Database Designer	$105.00	35.7	$ 3,748.50
		106	William Smithfield	Programmer	$ 35.75	12.6	$ 450.45
		102	David H. Senior	Systems Analyst	$ 96.75	23.8	$ 2,302.65
				Subtotal			**$10,549.70**
18	Amber Wave	114	Annelise Jones	Applications Designer	$ 48.10	25.6	$ 1,183.26
		118	James J. Frommer	General Support	$ 18.36	45.3	$ 831.71
		104	Anne K. Ramoras*	Systems Analyst	$ 96.75	32.4	$ 3,135.70
		112	Darlene M. Smithson	DSS Analyst	$ 45.95	45.0	$ 2,021.80
				Subtotal			**$ 7,172.47**

Contoh : Ada Laporan sbb

22	Rolling Tide	105	Alice K. Johnson	Database Designer	$105.00	65.7	$ 6,793.50
		104	Anne K. Ramoras	Systems Analyst	$ 96.75	48.4	$ 4,682.70
		113	Delbert K. Joenbrood*	Applications Designer	$ 48.10	23.6	$ 1,135.16
		111	Geoff B. Wabash	Clerical Support	$ 26.87	22.0	$ 591.14
		106	William Smithfield	Programmer	$ 35.75	12.8	$ 457.60
				Subtotal			**$13,660.10**
25	Starflight	107	Maria D. Alonzo	Programmer	$ 35.75	25.6	$ 879.45
		115	Travis B. Bawangi	Systems Analyst	$ 96.75	45.8	$ 4,431.15
		101	John G. News*	Database Designer	$105.00	56.3	$ 5,911.50
		114	Annelise Jones	Applications Designer	$ 48.10	33.1	$ 1,592.11
		108	Ralph B. Washington	Systems Analyst	$ 96.75	23.6	$ 2,283.30
		118	James J. Frommer	General Support	$ 18.36	30.5	$ 559.98
		112	Darlene M. Smithson	DSS Analyst	$ 45.95	41.4	$ 1,902.33
				Subtotal			**$17,559.82**
				Total			**$48,942.09**

Dibuat Tabel nya

FIGURE 5.1 **Tabular representation of the report format**

Table name: RPT_FORMAT **Database name: Ch05_ConstructCo**

PROJ_NUM	PROJ_NAME	EMP_NUM	EMP_NAME	JOB_CLASS	CHG_HOUR	HOURS
15	Evergreen	103	June E. Arbough	Elect. Engineer	$84.50	23.8
		101	John G. News	Database Designer	$105.00	19.4
		105	Alice K. Johnson *	Database Designer	$105.00	35.7
		106	William Smithfield	Programmer	$35.75	12.6
		102	David H. Senior	Systems Analyst	$96.75	23.8
18	Amber Wave	114	Annelise Jones	Applications Designer	$48.10	24.6
		118	James J. Frommer	General Support	$18.36	45.3
		104	Anne K. Ramoras *	Systems Analyst	$96.75	32.4
		112	Darlene M. Smithson	DSS Analyst	$45.95	44.0
22	Rolling Tide	105	Alice K. Johnson	Database Designer	$105.00	64.7
		104	Anne K. Ramoras	Systems Analyst	$96.75	48.4
		113	Delbert K. Joenbrood *	Applications Designer	$48.10	23.6
		111	Geoff B. Wabash	Clerical Support	$26.87	22.0
		106	William Smithfield	Programmer	$35.75	12.8
25	Starflight	107	Maria D. Alonzo	Programmer	$35.75	24.6
		115	Travis B. Bawangi	Systems Analyst	$96.75	45.8
		101	John G. News *	Database Designer	$105.00	56.3
		114	Annelise Jones	Applications Designer	$48.10	33.1
		108	Ralph B. Washington	Systems Analyst	$96.75	23.6
		118	James J. Frommer	General Support	$18.36	30.5
		112	Darlene M. Smithson	DSS Analyst	$45.95	41.4

BELUM! ➔ Buat Normal Pertama

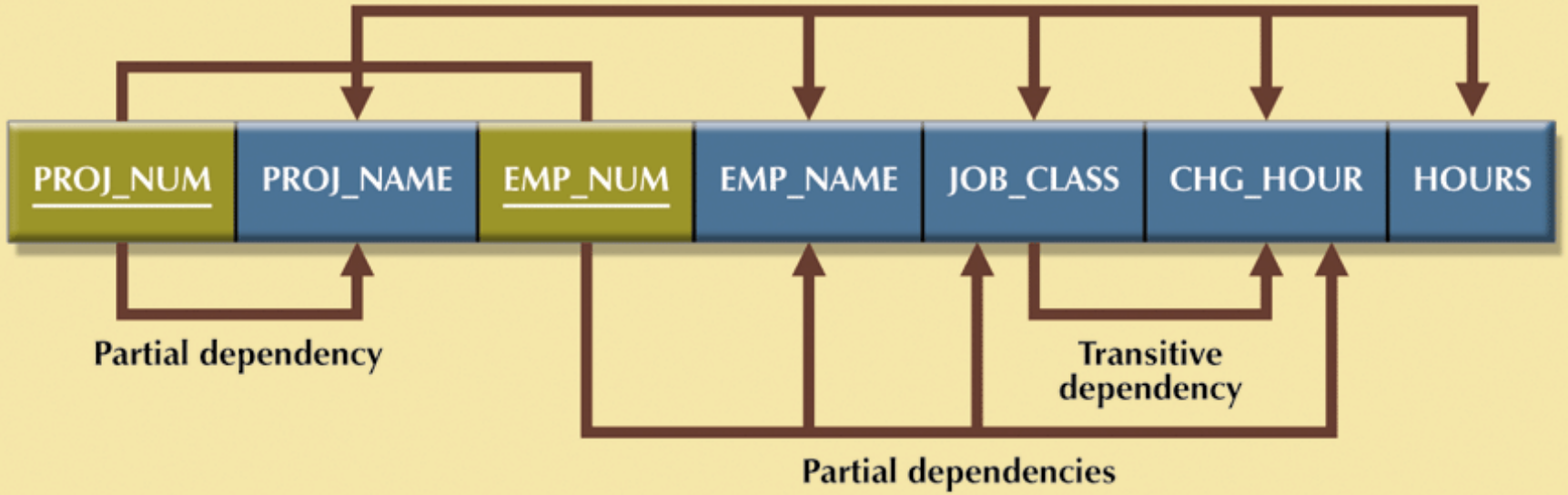
FIGURE 5.2 **A table in first normal form**

Table name: DATA_ORG_1NF Database name: Ch05_ConstructCo

PROJ_NUM	PROJ_NAME	EMP_NUM	EMP_NAME	JOB_CLASS	CHG_HOUR	HOURS
15	Evergreen	103	June E. Arbough	Elect. Engineer	$84.50	23.8
15	Evergreen	101	John G. News	Database Designer	$105.00	19.4
15	Evergreen	105	Alice K. Johnson *	Database Designer	$105.00	35.7
15	Evergreen	106	William Smithfield	Programmer	$35.75	12.6
15	Evergreen	102	David H. Senior	Systems Analyst	$96.75	23.8
18	Amber Wave	114	Annelise Jones	Applications Designer	$48.10	24.6
18	Amber Wave	118	James J. Frommer	General Support	$18.36	45.3
18	Amber Wave	104	Anne K. Ramoras *	Systems Analyst	$96.75	32.4
18	Amber Wave	112	Darlene M. Smithson	DSS Analyst	$45.95	44.0
22	Rolling Tide	105	Alice K. Johnson	Database Designer	$105.00	64.7
22	Rolling Tide	104	Anne K. Ramoras	Systems Analyst	$96.75	48.4
22	Rolling Tide	113	Delbert K. Joenbrood *	Applications Designer	$48.10	23.6
22	Rolling Tide	111	Geoff B. Wabash	Clerical Support	$26.87	22.0
22	Rolling Tide	106	William Smithfield	Programmer	$35.75	12.8
25	Starflight	107	Maria D. Alonzo	Programmer	$35.75	24.6
25	Starflight	115	Travis B. Bawangi	Systems Analyst	$96.75	45.8
25	Starflight	101	John G. News *	Database Designer	$105.00	56.3
25	Starflight	114	Annelise Jones	Applications Designer	$48.10	33.1
25	Starflight	108	Ralph B. Washington	Systems Analyst	$96.75	23.6
25	Starflight	118	James J. Frommer	General Support	$18.36	30.5
25	Starflight	112	Darlene M. Smithson	DSS Analyst	$45.95	41.4

Identifikasi Kebergantungan Fungsional

FIGURE 5.3 First normal form (1NF) dependency diagram



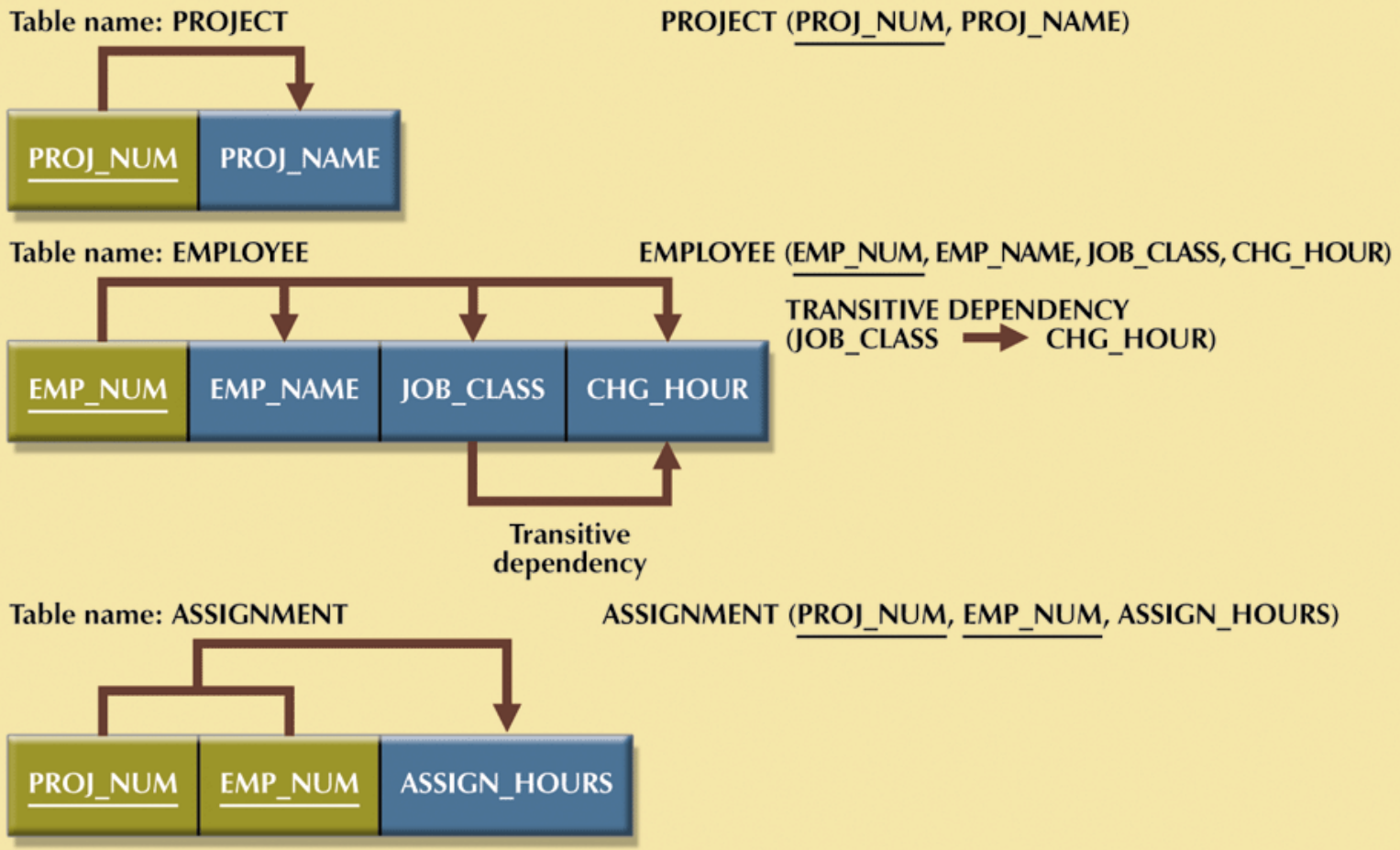
1NF (PROJ_NUM, EMP_NUM, PROJ_NAME, EMP_NAME, JOB_CLASS, CHG_HOURS, HOURS)

PARTIAL DEPENDENCIES:
(PROJ_NUM → PROJ_NAME)
(EMP_NUM → EMP_NAME, JOB_CLASS, CHG_HOUR)

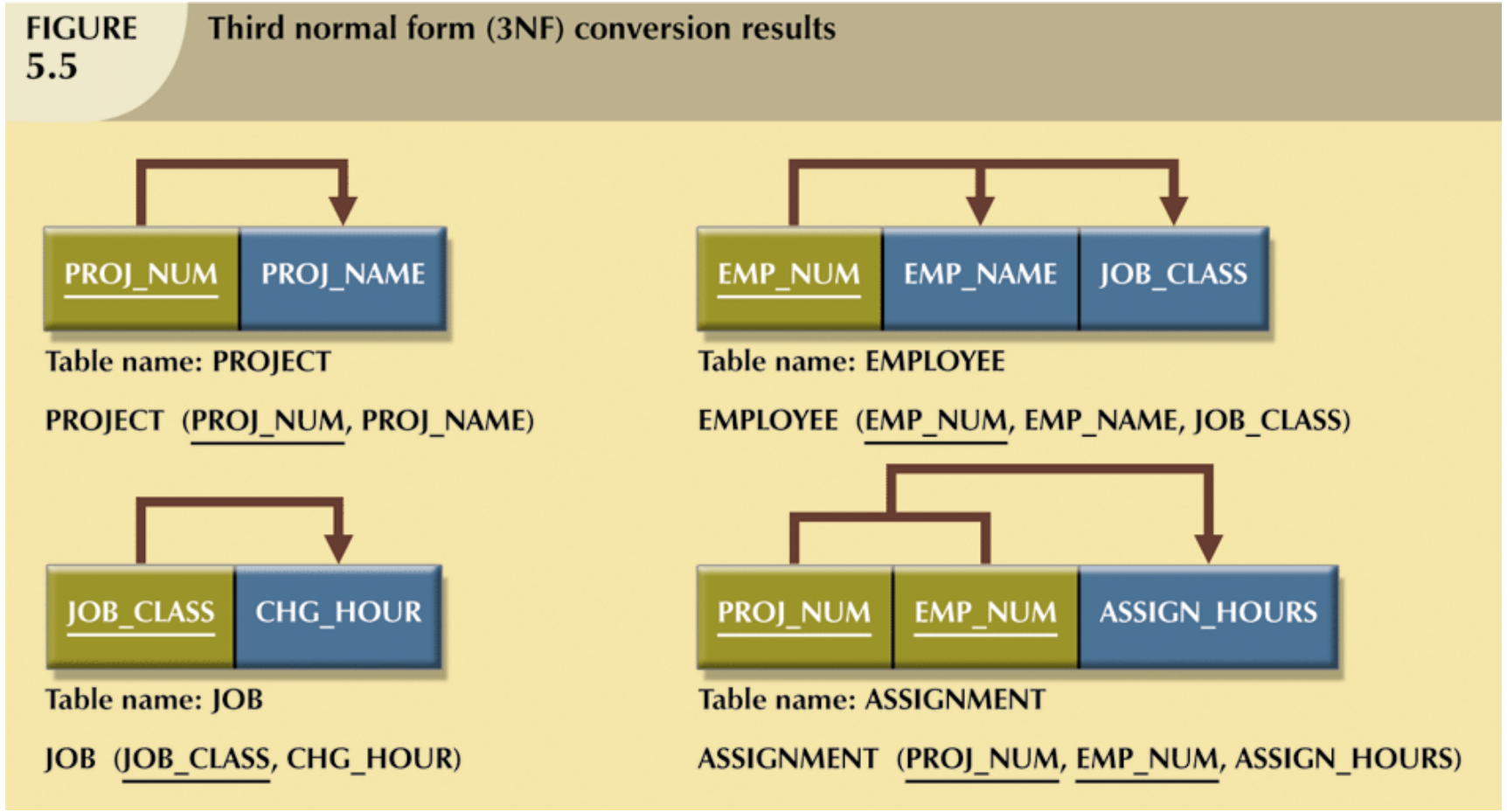
TRANSITIVE DEPENDENCY:
(JOB CLASS → CHG_HOUR)

Ubah ke Bentuk Normal Kedua

FIGURE 5.4 Second normal form (2NF) conversion results

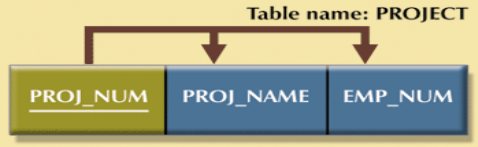


Ubah ke Bentuk Normal Ketiga



BASIS DATA
SUDAH NORMAL
SD BETUK KETIGA

FIGURE 5.6 The completed database



Database name: Ch05_ConstructCo

Table name: PROJECT

PROJ_NUM	PROJ_NAME	EMP_NUM
15	Evergreen	105
18	Amber Wave	104
22	Rolling Tide	113
25	Starflight	101

Table name: JOB

JOB_CODE	JOB_DESCRIPTION	JOB_CHG_HOUR
500	Programmer	$35.75
501	Systems Analyst	$96.75
502	Database Designer	$105.00
503	Electrical Engineer	$84.50
504	Mechanical Engineer	$67.90
505	Civil Engineer	$55.78
506	Clerical Support	$26.87
507	DSS Analyst	$45.95
508	Applications Designer	$48.10
509	Bio Technician	$34.55
510	General Support	$18.36

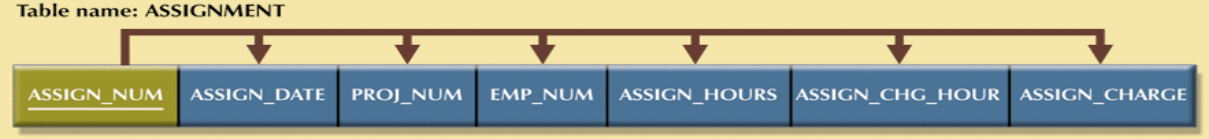


Table name: ASSIGNMENT

ASSIGN_NUM	ASSIGN_DATE	PROJ_NUM	EMP_NUM	ASSIGN_HOURS	ASSIGN_CHG_HOUR	ASSIGN_CHARGE
1001	04-Mar-06	15	103	2.6	$84.50	$219.70
1002	04-Mar-06	18	118	1.4	$18.36	$25.70
1003	05-Mar-06	15	101	3.6	$105.00	$378.00
1004	05-Mar-06	22	113	2.5	$48.10	$120.25
1005	05-Mar-06	15	103	1.9	$84.50	$160.55
1006	05-Mar-06	25	115	4.2	$96.75	$406.35
1007	05-Mar-06	22	105	5.2	$105.00	$546.00
1008	05-Mar-06	25	101	1.7	$105.00	$178.50
1009	05-Mar-06	15	105	2.0	$105.00	$210.00
1010	06-Mar-06	15	102	3.8	$96.75	$367.65
1011	06-Mar-06	22	104	2.6	$96.75	$251.55
1012	06-Mar-06	15	101	2.3	$105.00	$241.50
1013	06-Mar-06	25	114	1.8	$48.10	$86.58
1014	06-Mar-06	22	111	4.0	$26.87	$107.48
1015	06-Mar-06	25	114	3.4	$48.10	$163.54
1016	06-Mar-06	18	112	1.2	$45.95	$55.14
1017	06-Mar-06	18	118	2.0	$18.36	$36.72
1018	06-Mar-06	18	104	2.6	$96.75	$251.55
1019	06-Mar-06	15	103	3.0	$84.50	$253.50
1020	07-Mar-06	22	105	2.7	$105.00	$283.50
1021	08-Mar-06	25	108	4.2	$96.75	$406.35
1022	07-Mar-06	25	114	5.8	$48.10	$278.98
1023	07-Mar-06	22	106	2.4	$35.75	$85.80

..(continued)

FIGURE 5.6 The completed database (continued)

Table name: EMPLOYEE

Table name: EMPLOYEE

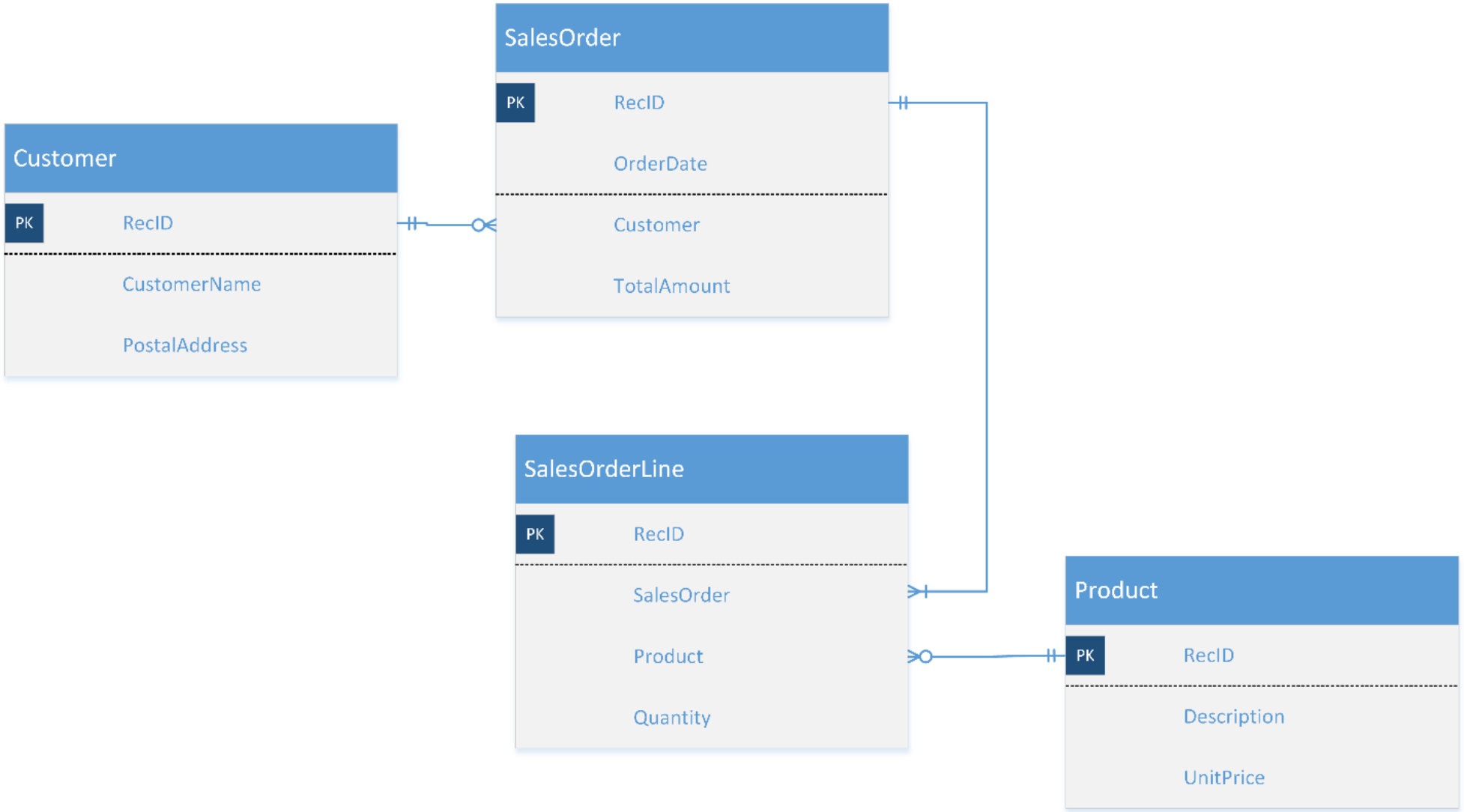
EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE
101	News	John	G	08-Nov-00	502
102	Senior	David	H	12-Jul-89	501
103	Arbough	June	E	01-Dec-97	503
104	Ramoras	Anne	K	15-Nov-88	501
105	Johnson	Alice	K	01-Feb-94	502
106	Smithfield	William		22-Jun-05	500
107	Alonzo	Maria	D	10-Oct-94	500
108	Washington	Ralph	B	22-Aug-89	501
109	Smith	Larry	W	18-Jul-99	501
110	Olenko	Gerald	A	11-Dec-96	505
111	Wabash	Geoff	B	04-Apr-89	506
112	Smithson	Darlene	M	23-Oct-95	507
113	Joenbrood	Delbert	K	15-Nov-94	508
114	Jones	Annelise		20-Aug-91	508
115	Bawangi	Travis	B	25-Jan-90	501
116	Pratt	Gerald	L	05-Mar-95	510
117	Williamson	Angie	H	19-Jun-94	509
118	Frommer	James	J	04-Jan-06	510

Latihan : Periksa kembali kenormalan rancangan basis data hasil TUBES MK APPL

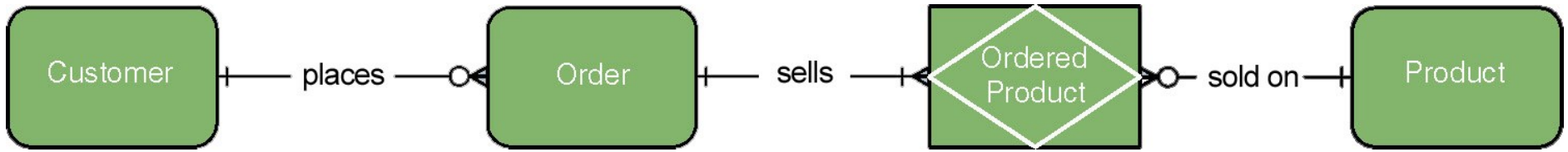
Sub Bahasan 2

- **Periksa kelengkapan atribut dan ketepatan domainnya**

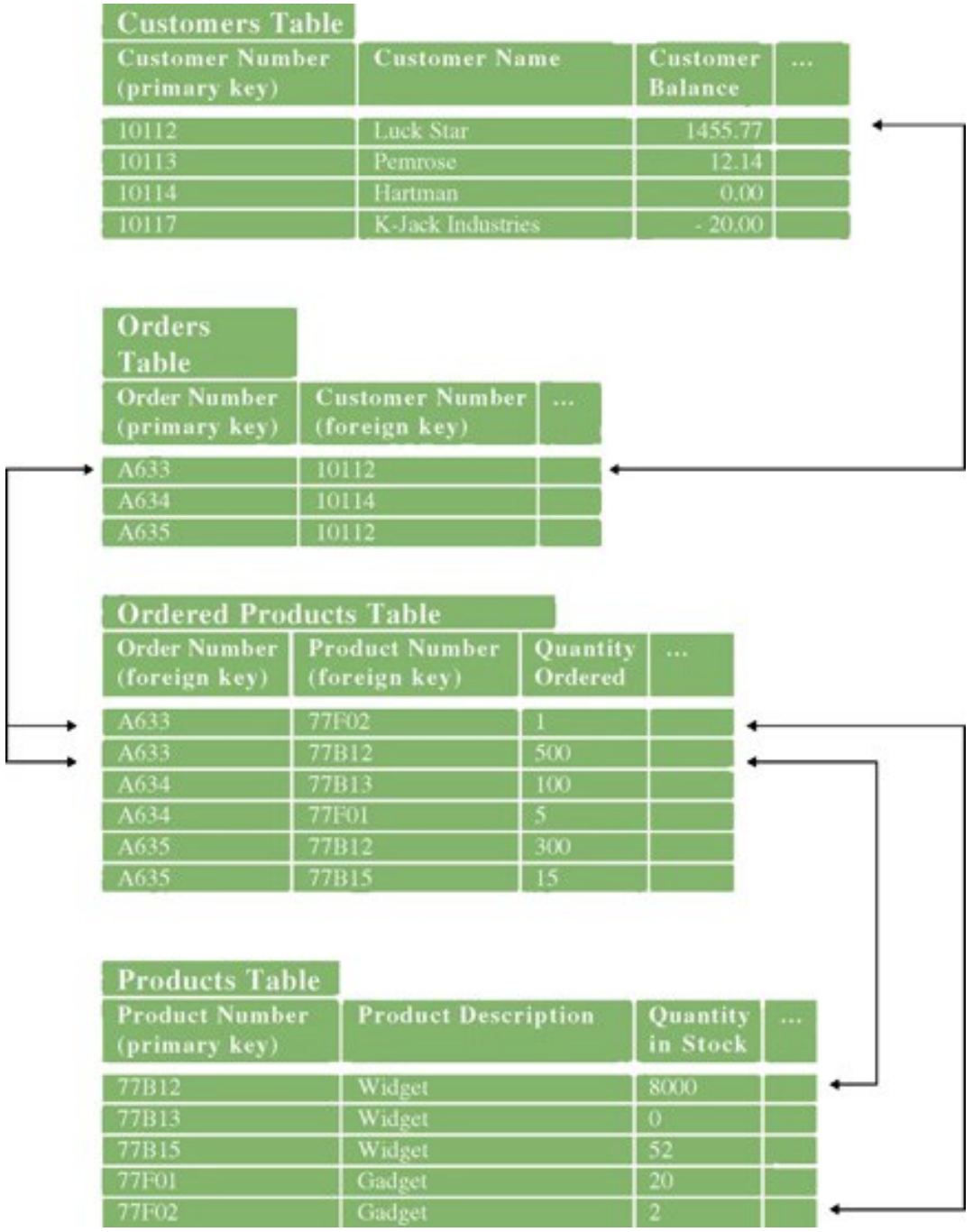
Kasus 1 : Lengkapkah atribut di ERD ini?



Untuk ERD berikut



Lengkapkah rancangan berikut?



Customers Table

Customer Number (primary key)	Customer Name	Customer Balance	...
10112	Luck Star	1455.77	
10113	Pemrose	12.14	
10114	Hartman	0.00	
10117	K-Jack Industries	- 20.00	

Orders Table

Order Number (primary key)	Customer Number (foreign key)	...
A633	10112	
A634	10114	
A635	10112	

Ordered Products Table

Order Number (foreign key)	Product Number (foreign key)	Quantity Ordered	...
A633	77F02	1	
A633	77B12	500	
A634	77B13	100	
A634	77F01	5	
A635	77B12	300	
A635	77B15	15	

Products Table

Product Number (primary key)	Product Description	Quantity in Stock	...
77B12	Widget	8000	
77B13	Widget	0	
77B15	Widget	52	
77F01	Gadget	20	
77F02	Gadget	2	

Attribute domain

- the **attribute domain** is the set of values allowed in an attribute
- Example :

Rooms in hotel (1-300) ➔ **integer**

Age (1-99) ➔ **integer**

Married (yes or no) ➔ **boolean**

Nationality (Nepalese, Indian, American, or British) ➔ **varchar(10)**

Colors (Red, Yellow, Green) ➔ **varchar (10)**

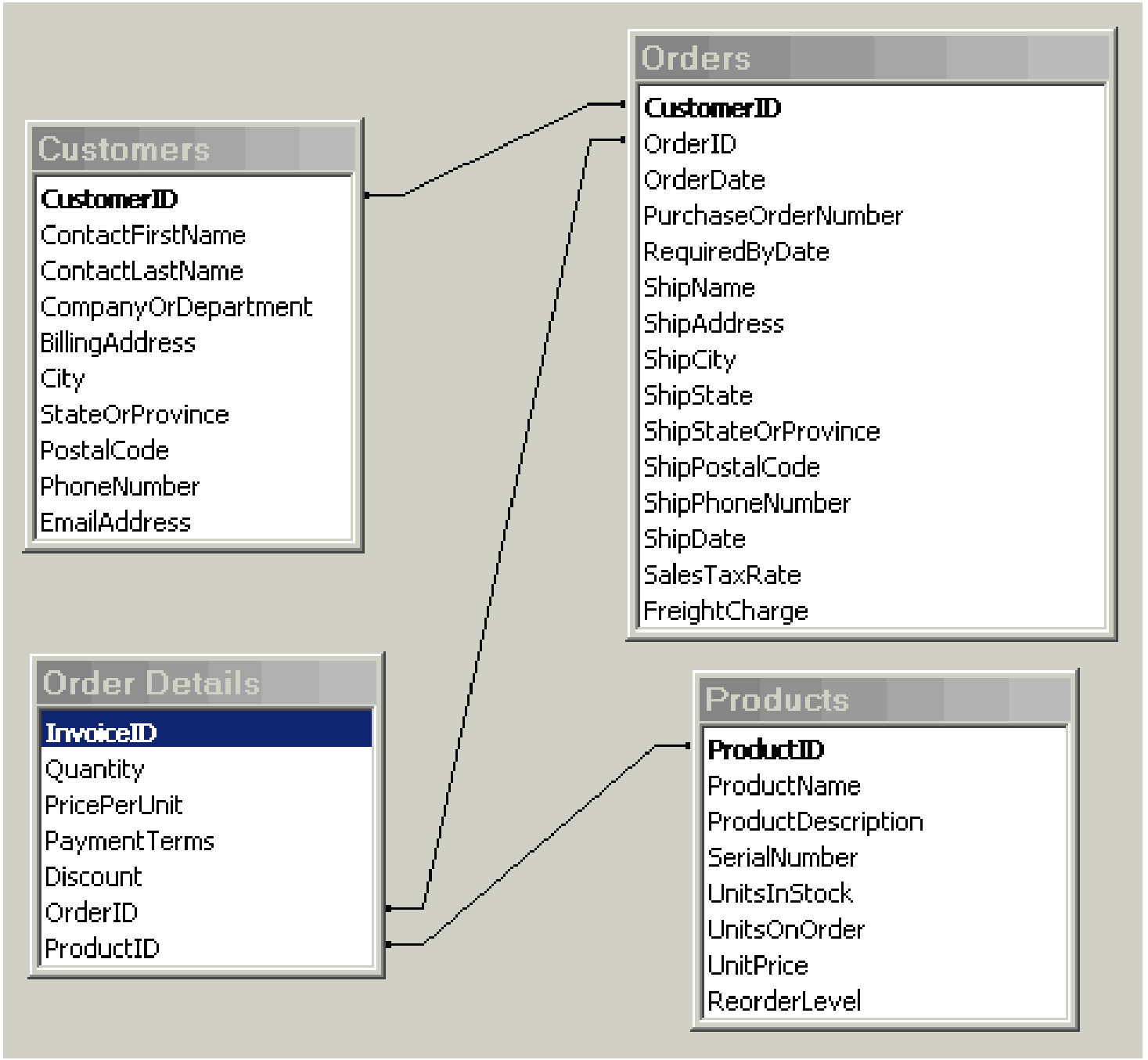
Latihan : Periksa kembali domain setiap atribut di setiap Tabel Basis Data TUBES APPL

Sub Bahasan 3

- Periksa kembali hubungan antar tabel (Primary Key – Foreign Key)

Kasus :

- Yang mana Primary Key?
- Yang mana Foreign Key?



Latihan : Periksa kembali primary key – foreign key di rancangan basis data TUBES APPL Anda

Sub Bahasan 4. Memilih DBMS

194 systems in ranking, October 2013

Rank	Last Month	DBMS	Database Model	Score	Changes
1.	1.	Oracle	Relational DBMS	1583.84	+54.23
2.	3.	MySQL	Relational DBMS	1331.34	+25.58
3.	2.	Microsoft SQL Server	Relational DBMS	1207.00	-106.78
4.	4.	PostgreSQL	Relational DBMS	177.01	-5.22
5.	5.	DB2	Relational DBMS	175.83	+3.58
6.	6.	MongoDB	Document store	149.48	-2.71
7.	7.	Microsoft Access	Relational DBMS	142.49	-4.21
8.	8.	SQLite	Relational DBMS	77.88	-4.90
9.	9.	Sybase	Relational DBMS	73.66	-1.68
10.	11.	Teradata	Relational DBMS	54.41	+3.32

Data Types for Different Database Technologies

Logical Data Type to be stored in field)	**Physical Data Type MS *Access***	**Physical Data Type MS *SQL Server***	**Physical Data Type Oracle**
Fixed length character data *(use for fields with relatively fixed length character data)*	TEXT	CHAR (size) *or* character (size)	CHAR (size)
Variable length character data *(use for fields that require character data but for which size varies greatly--such as ADDRESS)*	TEXT	VARCHAR (max size) *or* character varying (max size)	VARCHAR (max size)
Very long character data *(use for long descriptions and notes--usually no more than one such field per record)*	MEMO	TEXT	LONG VARCHAR *or* LONG VARCHAR2

Data Types for Different Database Technologies (cont.)

Logical Data Type to be stored in field)	**Physical Data Type MS *Access***	**Physical Data Type MS *SQL Server***	**Physical Data Type Oracle**
Integer number	NUMBER	INT (size) *or* integer *or* smallinteger *or* tinuinteger	INTEGER (size) *or* NUMBER (size)
Decimal number	NUMBER	DECIMAL (size, decimal places) *or* NUMERIC (size, decimal places)	DECIMAL (size, decimal places) *or* NUMERIC (size, decimal places) *or* NUMBER
Financial Number	CURRENCY	MONEY	*see decimal number*
Date (with time)	DATE/TIME	DATETIME *or* SMALLDATETIME *Depending on precision needed*	DATE
Current time *(use to store the data and time from the computer's system clock)*	*not supported*	TIMESTAMP	*not supported*

Data Types for Different Database Technologies (cont.)

Logical Data Type to be stored in field)	**Physical Data Type MS *Access***	**Physical Data Type MS *SQL Server***	**Physical Data Type Oracle**
Yes or No; *or* True or False	YES/NO	BIT	*use CHAR(1) and set a yes or no domain*
Image	OLE OBJECT	IMAGE	LONGRAW
Hyperlink	HYPERLINK	VARBINARY	RAW
Can designer define new data types?	NO	YES	YES

Sub Bahasan 5. SQL for CREATE TABLE

Create table

The **CREATE** command combined with the word TABLE is used to create a new table. When creating a table, you need to name the fields/columns in the table and assign them a type and size. In this presentation I will cover some basic data types.

Data Type	Description
VARCHAR2(size)	Variable length character data - max 4000
CHAR(size)	Fixed length character data - max 2000
NUMBER(len, dec)	Numeric data with length and # decimal digits
DATE	Date format

EXAMPLE:

```
SQL> CREATE TABLE first_pay
  2  (pay_id          varchar2(4),
  3   name            varchar2(20),
  4   jobcode         char(2),
  5   startdate       date,
  6   salary          number(9,2),
  7   bonus           number(5));

Table created.
```

Explained on next slide!

Create table

Name of table you are creating for the database.

VARCHAR2 is a variable length character field. The number of characters is in parenthesis.Variable length means the length is determined by the actual number of characters entered.

Column/field names listed in parenthesis.

The default date is in the format day-mon-yr and is shown as 03-JUL-00.

```
SQL> CREATE TABLE first_pay
  2   (pay_id          varchar2(4),
  3    name            varchar2(20),
  4    jobcode         char(2),
  5    startdate       date,
  6    salary          number(9,2),
  7    bonus           number(5));

Table created.
```

Names of columns/fields.

Note: letters, numbers and underscore used in name. Start with letter.

CHAR is a fixed length field with the number of characters in parenthesis. The field is always that length. Most frequently used with codes, state abbreviation etc.

NUMBER is followed by length in parenthesis. If there are decimal positions, the parenthesis contains length and number of decimal positions.

As always, the statement is terminated with a semi-colon.

Describe table

```
SQL> CREATE TABLE first_pay
  2  (pay_id          varchar2(4),
  3   name            varchar2(20),
  4   jobcode         char(2),
  5   startdate       date,
  6   salary          number(9,2),
  7   bonus           number(5));

Table created.

SQL> DESCRIBE first_pay;
 Name                              Null?    Type
 --------------------------------- -------- ----
 PAY_ID                                     VARCHAR2(4)
 NAME                                       VARCHAR2(20)
 JOBCODE                                    CHAR(2)
 STARTDATE                                  DATE
 SALARY                                     NUMBER(9,2)
 BONUS                                      NUMBER(5)
```

DESCRIBE first_pay;

Displays the table structure.

Insert into

```
SQL> CREATE TABLE first_pay
  2  (pay_id           varchar2(4),
  3   name             varchar2(20),
  4   jobcode          char(2),
  5   startdate        date,
  6   salary           number(9,2),
  7   bonus            number(5));
```

NOTE: In the INSERT, varchar2, char and date columns/fields are enclosed in single quotes. Numeric fields are not enclosed in quotes.

```
SQL> INSERT INTO first_pay
  2  VALUES('1111','Linda Costa','CI','15-JAN-97',45000.00,1000);

1 row created.

SQL> SELECT *
  2  FROM first_pay;

PAY_ NAME                 JO STARTDATE     SALARY      BONUS
---- -------------------- -- --------- ---------- ---------
1111 Linda Costa          CI 15-JAN-97      45000       1000
```

Insert into

```
SQL> INSERT INTO first_pay
  2  VALUES('2222','John Davidson','IN','25-SEP-92',40000.00,1500);

1 row created.

SQL> INSERT INTO first_pay
  2  VALUES('3333','Susan Ash','AP','05-FEB-00',25000.00,500);

1 row created.

SQL> INSERT INTO first_pay
  2  VALUES('4444','Stephen York','CM','03-JUL-97',42000.00,2000);

1 row created.

SQL> SELECT *
  2  FROM first_pay;

PAY_ NAME                 JO STARTDATE    SALARY     BONUS
---- -------------------- -- --------- ---------- ---------
1111 Linda Costa          CI 15-JAN-97      45000      1000
2222 John Davidson        IN 25-SEP-92      40000      1500
3333 Susan Ash            AP 05-FEB-00      25000       500
4444 Stephen York         CM 03-JUL-97      42000      2000
```

Sub Bahasan 6. Saatnya berlatih di kelas

Pilih salah satu table dari rancangan basis data Anda
Buat perintah SQL untuk membuatnya

TUGAS MINGGUAN

(1) BUATLAH PERINTAH SQL

– CREATE TABLE

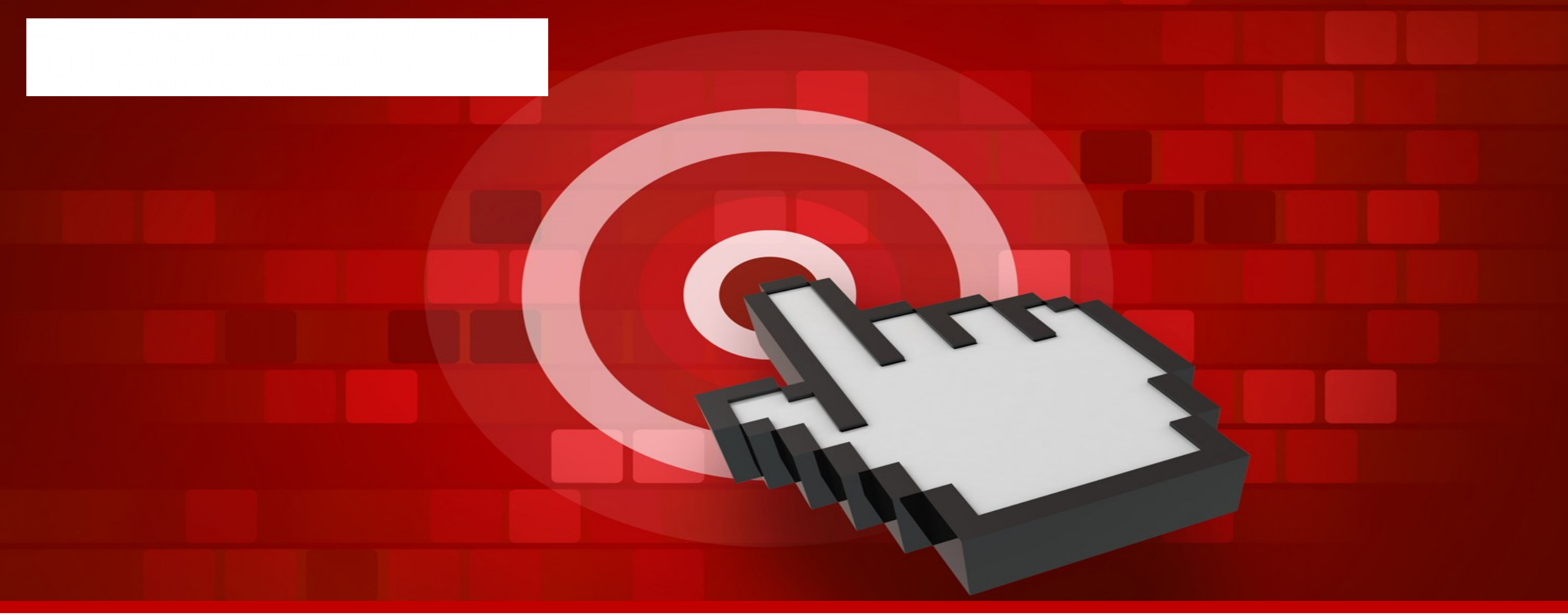
– INSERT

– SELECT

Untuk seluruh rancangan Tabel Anda.

(2) Simpan di Github

(3) Laporkan screenshoot code SQL Kelompok Anda di GitHub, softcopy ke email dosen kelas Anda



THANK YOU