

Database Management System Lab (CS-2094)

KALINGA INSTITUTE OF INDUSTRIAL
TECHNOLOGY

School of Computer Engineering



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1 Credit

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Lab Contents

2

Sr #	Major and Detailed Coverage Area	Lab#
1	Integrity Constraints DDL and DML	3

SQL constraints



3

SQL Constraints

Constraints enforce rules on tables. Constraints can be imposed to the database tables either with the **CREATE** or **ALTER** command. Whenever a DML operation is to be performed on a table, the specified constraint must be satisfied for the operation to succeed

Naming a Constraint

A constraint can be identified by an internal or user-defined name. For a user's account, each constraint name must be unique. The standard convention for naming constraint is :
<table name>_<column name>_<constraint type>

The abbreviation for different constraint types are: *pk* for PRIMARY Key, *fk* for FOREIGN Key, *uk* for UNIQUE, *chk* or *ck* for CHECK and *nn* for NOT NULL constraint
If you do not name a constraint, then the server will generate a name for it by using *SYS_Cn* format

Defining a Constraint



4

Constraint can be defined in either of the two ways:

- **Column level:**
 - A column- level constraint references a single column and is defined along with the definition of the column
 - This type of constraint is applied to the current column only
 - **column datatype [CONSTRAINT constraint_name] constraint_type**
- **Table level:**
 - A table- level constraint references one or more columns and is defined separately from the definitions of the columns
 - Except the NOT NULL constraint, all other constraints can be defined at the table level
 - **[CONSTRAINT constraint_name] constraint_type (column,..)**

Normally, simple keys are defined at the column level and composite keys are defined at the table level

NOT NULL Constraint



5

It ensures that the column has a value and the value is not a NULL value

It prevents a column from accepting NULL values. The syntax is:

columnname datatype(size) NOT NULL or

**columnname datatype(size) CONSTRAINT constraintname
NOT NULL**

It can only be applied at column level

*name VARCHAR(20) CONSTRAINT student_name_nn NOT
NULL*

NOT NULL Constraint



6

Let the structure of ITEM_MASTER table is:

Column	Type	Size
Item_no	NUMBER	4
Name	VARCHAR2	20
Qty_on_hand	NUMBER	5
Category	CHAR	1
Unit_measure	CHAR	4
Reorder_Lvl	NUMBER	5
Reorder_qty	NUMBER	5
Rate	NUMBER	8,2

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4), Name  
VARCHAR2(20), Qty_on_hand NUMBER(5), Category  
CHAR(1), Unit_measure CHAR(4), Reorder_Lvl NUMBER(5),  
Reorder_qty NUMBER(5), Rate NUMBER(8,2));
```

Let the Item_no, Reorder_Lvl, Reorder_qty and Rate columns are NOT NULL

NOT NULL Constraint



7

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4) NOT  
NULL, Name VARCHAR2(20), Qty_on_hand NUMBER(5),  
Category CHAR(1), Unit_measure CHAR(4), Reorder_Lvl  
NUMBER(5) NOT NULL, Reorder_qty NUMBER(5) NOT  
NULL, Rate NUMBER(8,2) NOT NULL);
```

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4)  
CONSTRAINT c1 NOT NULL, Name VARCHAR2(20),  
Qty_on_hand NUMBER(5), Category CHAR(1), Unit_measure  
CHAR(4), Reorder_Lvl NUMBER(5) CONSTRAINT c2 NOT  
NULL, Reorder_qty NUMBER(5) CONSTRAINT c3 NOT  
NULL, Rate NUMBER(8,2) CONSTRAINT c4 NOT NULL);
```

NOT NULL Constraint

8

SQL NOT NULL on ALTER TABLE

To create a `NOT NULL` constraint on the "Age" column when the "Persons" table is already created, use the following SQL:

```
ALTER TABLE Persons  
MODIFY Age int NOT NULL;
```

Dropping NOT NULL Constraint

A NOT NULL constraint can be dropped by executing **ALTER TABLE tablename DROP CONSTRAINT constraintname;**

ALTER TABLE ITEM_MASTER DROP CONSTRAINT c4;

UNIQUE Constraint



9

It ensures every value in a column or set of columns be unique
The unique constraint allows NULL values. The syntax is:

Column level: **Columnname datatype(size) UNIQUE** or

**Columnname datatype(size) CONSTRAINT constraintname
UNIQUE**

Table level: **CONSTRAINT constraintname
UNIQUE(columns)**

*mob_no NUMBER(10) CONSTRAINT student_mob_uk
UNIQUE*

CONSTRAINT student_mob_uk UNIQUE(mob_no)

Unique Constraint...

10

Let the Name column in ITEM_MASTER table is unique:

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4) NOT NULL, Name VARCHAR2(20) UNIQUE, Qty_on_hand NUMBER(5), Category CHAR(1), Unit_measure CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL, Reorder_qty NUMBER(5) NOT NULL, Rate NUMBER(8,2) NOT NULL);
```

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4) NOT NULL, Name VARCHAR2(20) , Qty_on_hand NUMBER(5), Category CHAR(1), Unit_measure CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL, Reorder_qty NUMBER(5) NOT NULL, Rate NUMBER(8,2) NOT NULL), CONSTRAINT ce3 UNIQUE(Name) ;
```

Unique Constraint...

11

The composite unique key constraint can be defined only at the table level by specifying column names separated by a comma within parentheses

CONSTRAINT student_name_city_uk UNIQUE(name, city)

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4) NOT NULL, Name VARCHAR2(20) , Qty_on_hand NUMBER(5), Category CHAR(1), Unit_measure CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL, Reorder_qty NUMBER(5) NOT NULL, Rate NUMBER(8,2) NOT NULL), CONSTRAINT ce4 UNIQUE(Item_no,Name) ;
```

Dealing with UNIQUE Constraint in an existing table



12

The syntax for adding unique constraint is:

**ALTER TABLE tablename ADD CONSTRAINT
constraintname UNIQUE(columns);**

*ALTER TABLE ITEM_MASTER ADD CONSTRAINT C4
UNIQUE(Name);*

The syntax for dropping unique constraint is:

**ALTER TABLE tablename DROP CONSTRAINT
constraintname;**

ALTER TABLE ITEM_MASTER DROP CONSTRAINT C4;

Primary Key Constraint



13

Primary key constraint is also known as the **entity integrity constraint**

A table can have at most one primary key constraint

PRIMARY key is equivalent to the combination of NOT NULL constraint and UNIQUE constraint

Column level: **Columnname datatype(size) PRIMARY KEY** or

Columnname datatype(size) CONSTRAINT constraintname PRIMARY KEY

Table level: **CONSTRAINT constraintname PRIMARY KEY(columns)**

roll number(6) CONSTRAINT student_roll_pk PRIMARY KEY

CONSTRAINT student_roll_pk PRIMARY KEY(roll)

Primary Key Constraint



14

Let the Item_no column in ITEM_MASTER table is primary key:

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4)  
PRIMARY KEY, Name VARCHAR2(20) UNIQUE,  
Qty_on_hand NUMBER(5), Category CHAR(1), Unit_measure  
CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL, Reorder_qty  
NUMBER(5) NOT NULL, Rate NUMBER(8,2) NOT NULL);
```

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4), Name  
VARCHAR2(20) UNIQUE, Qty_on_hand NUMBER(5),  
Category CHAR(1), Unit_measure CHAR(4), Reorder_Lvl  
NUMBER(5) NOT NULL, Reorder_qty NUMBER(5) NOT  
NULL, Rate NUMBER(8,2) NOT NULL, CONSTRAINT C7  
PRIMARY KEY(Item_no));
```

Primary Key Constraint

15

To allow naming of a **PRIMARY KEY** constraint, and for defining a **PRIMARY KEY** constraint on multiple columns, use the following SQL syntax:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    CONSTRAINT PK_Person PRIMARY KEY (ID,LastName)
);
```

Note: In the example above there is only ONE **PRIMARY KEY** (PK_Person). However, the VALUE of the primary key is made up of TWO COLUMNS (ID + LastName).

Primary Key Constraint

16

To create a **PRIMARY KEY** constraint on the "ID" column when the table is already created, use the following SQL:

```
ALTER TABLE Persons  
ADD PRIMARY KEY (ID);
```

To allow naming of a **PRIMARY KEY** constraint, and for defining a **PRIMARY KEY** constraint on multiple columns, use the following SQL syntax:

```
ALTER TABLE Persons  
ADD CONSTRAINT PK_Person PRIMARY KEY (ID,LastName);
```

Note: If you use **ALTER TABLE** to add a primary key, the primary key column(s) must have been declared to not contain NULL values (when the table was first created).

Primary Key Constraint



17

Dealing with Primary Key Constraint in an existing table

The syntax for adding Primary key constraint is:

**ALTER TABLE tablename ADD CONSTRAINT
constraintname PRIMARY KEY(columns);**

*ALTER TABLE ITEM_MASTER ADD CONSTRAINT C5
PRIMARY KEY(Item_no);*

The syntax for dropping Primary key constraint is:

**ALTER TABLE tablename DROP PRIMARY KEY
[CASCADE];**

ALTER TABLE ITEM_MASTER DROP PRIMARY KEY; or

ALTER TABLE ITEM_MASTER DROP CONSTRAINT C5;

Foreign Key

18

It is also known as the **referential integrity constraint**. It establishes a relationship with the primary key of the same or another table. Foreign key and the referenced primary key columns need not have the same name, but the data type, size and domain must match

Column level: **Columnname datatype(size) [CONSTRAINT constraintname] REFERENCES tablename(columns)** or
Columnname datatype(size) [CONSTRAINT constraintname] REFERENCES tablename

Table level: **CONSTRAINT constraintname FOREIGN KEY(columns) REFERENCES tablename(columns)**

fid VARCHAR(6) CONSTRAINT student_fid_fk REFERENCES faculty(fid)

*CONSTRAINT student_fid_fk FOREIGN KEY(fid)
REFERENCES faculty(fid)*

Foreign Key..

19

The syntax for adding Foreign key constraint is:

**ALTER TABLE tablename ADD CONSTRAINT
constraintname FOREIGN KEY(columns) REFERENCES
tablename(columns);**

*ALTER TABLE ITEM_TRANS ADD CONSTRAINT C7
FOREIGN KEY(Item_no) REFERENCES
ITEM_MASTER(Item_no);*

The syntax for dropping Foreign key constraint is:

**ALTER TABLE tablename DROP CONSTRAINT
constraintname;**

ALTER TABLE ITEM_TRANS DROP CONSTRAINT C7;

Foreign Key..

20

ON DELETE CASCADE

This option can be added to allow deletion of a record in the parent table and deletion of the dependent records in the child table implicitly

Column level: **Columnname datatype(size) [CONSTRAINT constraintname] REFERENCES tablename(columns) [ON DELETE CASCADE]**

Table level: **CONSTRAINT constraintname FOREIGN KEY(columns) REFERENCES tablename(columns) [ON DELETE CASCADE]**

fid VARCHAR(6) CONSTRAINT student_fid_fk REFERENCES faculty(fid) ON DELETE CASCADE

*CONSTRAINT student_fid_fk FOREIGN KEY(fid)
REFERENCES faculty(fid) ON DELETE CASCADE*

Foreign Key..

21

Let ITEM_TRANS be the table where It_no references to the Item_no column in ITEM_MASTER table

Column	Type	Size
It_no	NUMBER	4
Trans_date	DATE	
qty	NUMBER	5

```
CREATE TABLE ITEM_TRANS(It_no NUMBER(4)
REFERENCES ITEM_MASTER(Item_no), trans_date DATE,
qty NUMBER(5));
```

CHECK CONSTRAINT



22

Check Constraint

It defines a condition that every row must satisfy. There can be more than one CHECK constraint on a column

Column level: **Columnname datatype(size) CONSTRAINT constraintname CHECK(condition)**

Table level: **CONSTRAINT constraintname
CHECK(condition)**

*age NUMBER(2) CONSTRAINT student_age_chk
CHECK((age>=15) AND (age<=50))*

*CONSTRAINT student_age_chk CHECK((age>=15) AND
(age<=50))*

*name VARCHAR(20) CONSTRAINT student_name_nn
CHECK(name is NOT NULL)*

CHECK CONSTRAINT..

23

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4)
PRIMARY KEY, Name VARCHAR2(20) UNIQUE,
Qty_on_hand NUMBER(5), Category CHAR(1)
CHECK(Category in('A', 'B', 'C'), Unit_measure CHAR(4),
Reorder_Lvl NUMBER(5) NOT NULL, Reorder_qty
NUMBER(5) NOT NULL, Rate NUMBER(8,2) NOT NULL);
```

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4)
PRIMARY KEY, Name VARCHAR2(20) UNIQUE,
Qty_on_hand NUMBER(5), Category CHAR(1) NOT NULL,
Unit_measure CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL,
Reorder_qty NUMBER(5) NOT NULL, Rate NUMBER(8,2)
NOT NULL, CHECK((Category='A' AND Rate<=1000) OR
(Category='B' AND Rate<=4500) OR (Category='C' AND
Rate>=4500)));
```

CHECK CONSTRAINT..



24

The syntax for adding Check constraint is:

**ALTER TABLE tablename ADD CONSTRAINT
constraintname CHECK (condition);**

*ALTER TABLE ITEM_TRANS ADD CONSTRAINT C8
CHECK(Category in('A', 'B', 'C'));*

The syntax for dropping Check constraint is:

**ALTER TABLE tablename DROP CONSTRAINT
constraintname;**

ALTER TABLE ITEM_TRANS DROP CONSTRAINT C8;

Default Value

25

DEFAULT Value

It ensures that a particular column will always have a value when a new record is inserted. The default value gets overwritten if a user enters another value. The default value is used if a NULL value is inserted. The DEFAULT value is defined in the column level. The syntax is:

Columnname datatype(size) DEFAULT value

```
CREATE TABLE ITEM_MASTER(Item_no NUMBER(4)
PRIMARY KEY, Name VARCHAR2(20) UNIQUE,
Qty_on_hand NUMBER(5) DEFAULT 100, Category CHAR(1),
Unit_measure CHAR(4), Reorder_Lvl NUMBER(5) NOT NULL,
Reorder_qty NUMBER(5) NOT NULL, Rate NUMBER(8,2)
NOT NULL);
```

Default Value..

26

If a column level constraint is defined on the column with a default value, then the default value must precede the constraint. The syntax is:

Columnname datatype(size) DEFAULT value constraint definition

*Qty_on_hand NUMBER(5) DEFAULT 100 CHECK
(Qty_on_hand>=100),*

Viewing USER Constraints



27

Viewing USER Constraints

User can view all the constraints by executing

SELECT * FROM USER_CONSTRAINTS;

If the user wants to view all the constraints applied to a single table, the syntax is:

**SELECT * FROM USER_CONSTRAINTS WHERE
TABLE_NAME= tablename;**

*SELECT * FROM USER_CONSTRAINTS WHERE
TABLE_NAME='ITEM_MASTER';*

Assignment 3

28

1. Create a table emp12, with attributes empid, empname, phno, age, and emp_country. Make emp id the primary key of the table. Make empname not null, phno unique and put a check constraint on age which make sure employees are not below 18. Put a default value “India” on emp_country.
2. Insert the following tuples into emp12 table.

empid	empname	phno	age	emp_country
112	Michael	234	19	Russia
113	Abdul	913	25	
131		678	43	USA
132	Riya	234	22	India
113	Lily	876	60	UK
127	Dino	777	17	Italy
117	Indira	676		

Assignment 3..

29

3. Drop the check constraint on age.
4. Put a default constraint with value 18 on age along with a check constraint which ensures age value is greater than or equal to 18 and less than or equal to 70.
5. Insert the following rows in the emp12 table.

empid	empname	phno	age	emp_country
114	Raj	238	54	USA
115	Abhay	222		

Assignment 3..

30

6. Create table projectx with attributes pid, pname, phead, ploc and pmembers. pmembers should have a default value of 5. Make (pid,pname) the primary key. Use a constraint named uc_px_34 to make phead and ploc unique. Put a check constraint named ck_px_5 on pmembers which ensures that the number of pmembers must not exceed 5.
7. Drop the primary key of the projectx table.
8. Put a constraint named pk_px_1 on pid, making pid the primary key of the table.
9. Insert the following rows in projectx table.

pid	pname	phead	ploc	pmembers
a11	dexter	112	Miami	2
p67	luna	113	Chennai	3
x55	east_west	114	Japan	

Assignment 3..

31

10. Delete all rows from emp12 table except the rows having primary keys (112, 113, 114).
11. Insert a column named project in the emp12 table.
12. Update the table as following.

empid	empname	phno	age	emp_country	project
112	Michael	234	19	Russia	a11
113	Abdul	913	25	India	p67
114	Raj	238	54	USA	x55

Assignment 3..

32

13. Make the project attribute of the emp12 table a foreign key that links it to the pid attribute of the projectx table.

14. Insert the following tuples in the emp12 table.

empid	empname	phno	age	emp_country	project
115	Bono	910			a11
116	Caitlin	660	25	UK	p67
117	Rajesh	200	60		x50

15. Make the phead attribute of the projectx table a foreign key that links it to the empid attribute of the emp12 table.

Assignment 3..

33

16. Display all the constraints there are in emp12 table.
17. Drop all the constraints in emp12 table one by one.
18. Make emp_id the primary key of the employee table (of assignment 2).
19. Make the dept attribute of the employee table a foreign key referring to the department table (of assignment 2).
20. Make d_name the primary key of the department table (of assignment 2).
21. Make the dept attribute of the employee table a foreign key referring to the d_name attribute of the department table (of assignment 2).