

Course	: BIC 21404 Database
Session	: II 2024/2025
Lab sheet	: 2
Objective	: At the end of the session, students are able to: <ol style="list-style-type: none"> Create table using command line Alter tables Inserting data into tables
Lab activity	: <ul style="list-style-type: none"> Create table using command line Alter tables Inserting data into tables

Introduction to Schema Objects

A database schema is a logical container for data structures, called schema objects. Examples of schema objects are tables and indexes. Schema objects are created and manipulated with SQL.

A database user has a password and various database privileges. Each user owns a single schema, which has the same name as the user. The schema contains the data for the user owning the schema. For example, the hr user owns the hr schema, which contains schema objects such as the employees table. In a production database, the schema owner usually represents a database application rather than a person.

Within a schema, each schema object of a particular type has a unique name. For example, hr.employees refers to the table employees in the hr schema. Figure 2-1 depicts a schema owner named hr and schema objects within the hr schema.

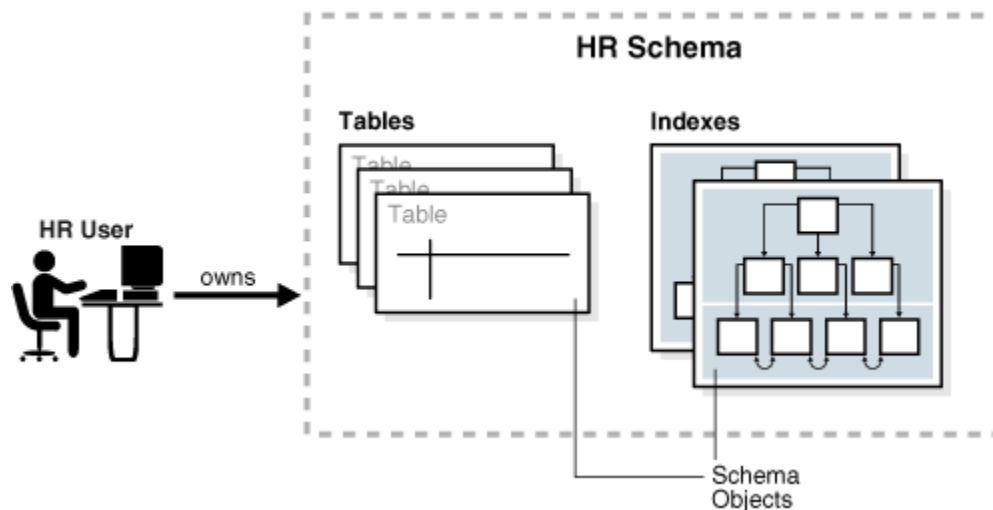


Figure 2-1: HR Schema

The hr schema is a sample schema that contains information about employees, departments and locations, work histories, and so on. The following Figure 2-2 is an entity-relationship diagram of the tables in the hr schema.

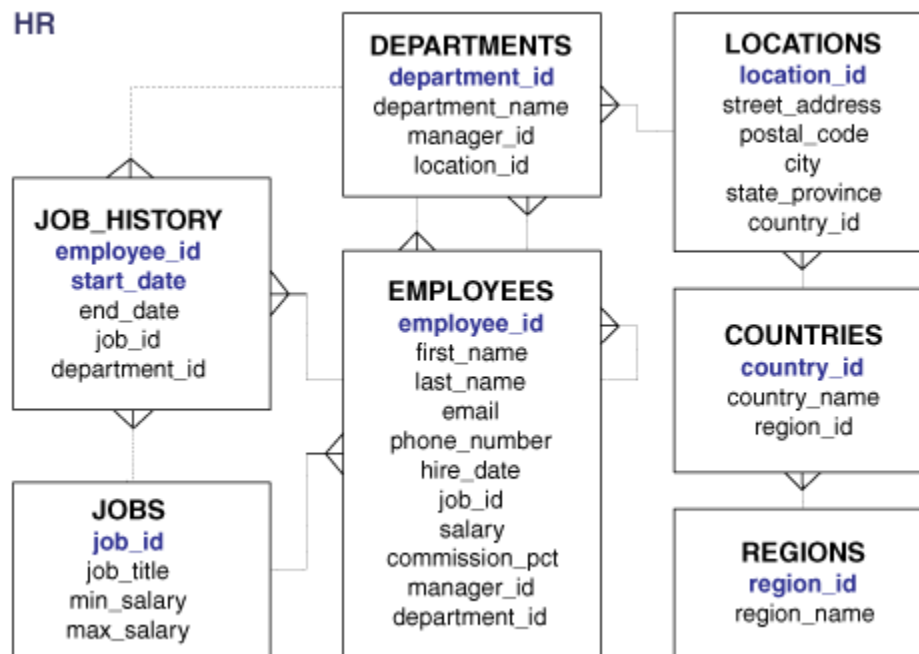


Figure 2-2: HUMAN RESOURCE (hr) Schema

Overview of Tables

A table is the basic unit of data organization in an Oracle database. A table describes an entity, which is something of significance about which information must be recorded. For example, an employee could be an entity.

A table definition includes a table name and set of columns. A column identifies an attribute of the entity described by the table. For example, the column `employee_id` in the `employees` table refers to the employee ID attribute of an employee entity.

In general, you give each column a column name, a data type, and a width when you create a table. For example, the data type for `employee_id` is `INT (6)`, indicating that this column can only contain numeric data up to 6 digits in width. The width can be predetermined by the data type, as in the case of `DATE`.

A table can contain a virtual column, which unlike a nonvirtual column does not consume disk space. The database derives the values in a virtual column on demand by computing a set of user-specified expressions or functions. For example, the virtual column `income` could be a function of the `salary` and `commission_pct` columns.

After you create a table, you can insert, query, delete, and update rows using SQL. A row is a collection of column information corresponding to a record in a table. For example, a row in the `employees` table describes the attributes of a specific employee.

Table 1: HUMANRESOURCE, hr Table Descriptions

Table DEPARTMENTS		
Name	Null?	Type

DEPARTMENT_ID (*primary key)	NOT NULL	INT(4)
DEPARTMENT_NAME	NOT NULL	VARCHAR(30)
MANAGER_ID		INT(6)
LOCATION_ID		INT(4)
Table EMPLOYEES		
Name	Null?	Type

EMPLOYEE_ID	NOT NULL	INT(6)
FIRST_NAME		VARCHAR(20)
LAST_NAME	NOT NULL	VARCHAR(25)
EMAIL	NOT NULL	VARCHAR(25)
PHONE_NUMBER		VARCHAR(20)
HIRE_DATE	NOT NULL	DATE
JOB_ID	NOT NULL	VARCHAR(10)
SALARY		INT(8,2)
COMMISSION_PCT		INT(2,2)
MANAGER_ID		INT(6)
DEPARTMENT_ID		INT(4)
Table JOBS		
Name	Null?	Type

JOB_ID	NOT NULL	VARCHAR(10)
JOB_TITLE	NOT NULL	VARCHAR(35)
MIN_SALARY		INT(6)
MAX_SALARY		INT(6)
Table JOB_HISTORY		
Name	Null?	Type

EMPLOYEE_ID	NOT NULL	INT(6)
START_DATE	NOT NULL	DATE
END_DATE	NOT NULL	DATE
JOB_ID	NOT NULL	VARCHAR(10)
DEPARTMENT_ID		INT(4)

Table LOCATIONS		
Name	Null?	Type
LOCATION_ID	NOT NULL	INT(4)
STREET_ADDRESS		VARCHAR(40)
POSTAL_CODE		VARCHAR(12)
CITY	NOT NULL	VARCHAR(30)
STATE_PROVINCE		VARCHAR(25)
COUNTRY_ID		CHAR(2)
Table REGIONS		
Name	Null?	Type
REGION_ID	NOT NULL	INT
REGION_NAME		VARCHAR(25)
Table COUNTRIES		
Name	Null?	Type
COUNTRY_ID	NOT NULL	CHAR(2)
COUNTRY_NAME		VARCHAR(40)
REGION_ID		INT

Unit 1: Creating a Database

- Activate XAMPP and phpMyAdmin.
- Click on the **SQL** tab in PhpMyAdmin.
- In the empty box, type the following statement

```
CREATE DATABASE IF NOT EXISTS hr;
```

- Click **Go**
- Check the new created database, hr.

Unit 2: Creating table(s)

- Click on the SQL tab. In the empty box type the following

```
USE hr;
```

```
CREATE TABLE DEPARTMENTS (
  DEPARTMENT_ID INT(4) NOT NULL AUTO_INCREMENT,
  DEPARTMENT_NAME VARCHAR(30) NOT NULL,
  MANAGER_ID INT(6),
```

```
LOCATION_ID INT(4),
PRIMARY KEY (DEPARTMENT_ID)
);
```

- ii. Fix errors if any.
- iii. Refresh the page and check newly created table in hr database.
- iv. Using the same step in (i), create all tables listed in Table 1.

DEPARTMENT SQL

```
DESC departments;
```

[\[Edit inline \]](#) [\[Edit \]](#) [\[Create PHP code \]](#)

Extra options

Field	Type	Null	Key	Default	Extra
DEPARTMENT_ID	int(4)	NO	PRI	NULL	auto_increment
DEPARTMENT_NAME	varchar(30)	NO		NULL	
MANAGER_ID	int(6)	YES		NULL	
LOCATION_ID	int(4)	YES		NULL	

EMPLOYEES SQL

Your SQL query has been executed successfully.

```
DESC EMPLOYEES;
```

[\[Edit inline \]](#) [\[Edit \]](#) [\[Create PHP code \]](#)

Extra options

Field	Type	Null	Key	Default	Extra
EMPLOYEE_ID	int(6)	NO		NULL	
FIRST_NAME	varchar(20)	YES		NULL	
LAST_NAME	varchar(25)	NO		NULL	
EMAIL	varchar(20)	NO		NULL	
PHONE_NUMBER	varchar(20)	YES		NULL	
HIRE_DATE	date	NO		NULL	
JOB_ID	varchar(10)	NO		NULL	
SALARY	decimal(10,2)	YES		NULL	
COMMISSION_PCT	decimal(4,2)	YES		NULL	
MANAGER_ID	int(6)	YES		NULL	
DEPARTMENT_ID	int(4)	YES		NULL	

JOBS SQL

DESC JOBS;

[[Edit inline](#)] [[Edit](#)] [[Create PHP code](#)]

Extra options

Field	Type	Null	Key	Default	Extra
JOB_ID	varchar(10)	NO		NULL	
JOB_TITLE	varchar(35)	NO		NULL	
MIN_SALARY	int(6)	YES		NULL	
DEPARTMENT_ID	int(6)	YES		NULL	

JOBS HISTORY SQL

DESC job_history;

[[Edit inline](#)] [[Edit](#)] [[Create PHP code](#)]

Extra options

Field	Type	Null	Key	Default	Extra
EMPLOYEE_ID	int(6)	NO		NULL	
START_DATE	date	NO		NULL	
END_DATE	date	NO		NULL	
JOB_ID	varchar(10)	NO		NULL	
DEPARTMENT_ID	int(4)	YES		NULL	

LOCATION SQL

DESC LOCATIONS;

[[Edit inline](#)] [[Edit](#)] [[Create PHP code](#)]

Extra options

Field	Type	Null	Key	Default	Extra
LOCATION_ID	int(4)	NO		NULL	
STREET_ADDRESS	varchar(40)	YES		NULL	
POSTAL_CODE	varchar(12)	YES		NULL	
CITY	varchar(30)	NO		NULL	
STATE_PROVINCE	varchar(25)	YES		NULL	
COUNTRY_ID	char(2)	YES		NULL	

REGIONS SQL

```
DESC REGIONS;
```

[[Edit inline](#)] [[Edit](#)] [[Create PHP code](#)]

Extra options

Field	Type	Null	Key	Default	Extra
REGION_ID	int(11)	NO		NULL	
REGION_NAME	varchar(25)	YES		NULL	

COUNTRIES SQL

```
DESC countries;
```

[[Edit inline](#)] [[Edit](#)] [[Create PHP code](#)]

Extra options

Field	Type	Null	Key	Default	Extra
COUNTRY_ID	char(2)	NO		NULL	
COUNTRY_NAME	varchar(40)	YES		NULL	
REGION_ID	int(11)	YES		NULL	

Unit 3: Displaying Table Structure

Check table structure for all created tables for hr database

1. Click on the table, and select *structure* tab



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	A
<input type="checkbox"/>	1 DEPARTMENT_ID	int(4)			No	None		AUTO_INCREMENT	
<input type="checkbox"/>	2 DEPARTMENT_NAME	varchar(30)	utf8mb4_general_ci		No	None			
<input type="checkbox"/>	3 MANAGER_ID	int(6)			Yes	NULL			
<input type="checkbox"/>	4 LOCATION_ID	int(4)			Yes	NULL			

Note

- DEFAULT is used to give a default value for the field when entering a new record.
- NULL means that the field can be empty. NOT NULL means the opposite.
- PRIMARY KEY is used to specify the field name which is to be used as a primary key.
- KEY is normally a synonym for INDEX. This is usually used to identify fields in a table which can be linked to primary keys in other tables.
- ENGINE=InnoDB: specifies the MySQL database engine as there are several MySQL engines.

- **AUTO_INCREMENT**: specifies which field is an auto-generated number.
- **AUTO_INCREMENT=1**: the first number to start with.
- **CHARSET** is a synonym for **CHARACTER SET**. MySQL allows storing data using a variety of character sets and to perform comparisons according to a variety of collations. For more information search for “MySQL charset”.
- **UNIQUE**: creates a constraint such that all values in the field must be distinct. However, in most MySQL engines, unique fields can be null. This makes it different from a primary key.

Data types

```

INT[(length)] [UNSIGNED] [ZEROFILL]
INTEGER[(length)] [UNSIGNED] [ZEROFILL]
BIGINT[(length)] [UNSIGNED] [ZEROFILL]
REAL[(length,decimals)] [UNSIGNED] [ZEROFILL]
DOUBLE[(length,decimals)] [UNSIGNED] [ZEROFILL]
FLOAT[(length,decimals)] [UNSIGNED] [ZEROFILL]
DECIMAL[(length[,decimals])] [UNSIGNED] [ZEROFILL]
NUMERIC[(length[,decimals])] [UNSIGNED] [ZEROFILL]
DATE
TIME
TIMESTAMP
DATETIME
YEAR
CHAR[(length)]
[CHARACTER SET charset_name] [COLLATE collation_name]
VARCHAR(length)
[CHARACTER SET charset_name] [COLLATE collation_name]
BINARY[(length)]
VARBINARY(length)
TINYBLOB
BLOB
MEDIUMBLOB
LONGBLOB
TINYTEXT [BINARY]
[CHARACTER SET charset_name] [COLLATE collation_name]
TEXT [BINARY]
[CHARACTER SET charset_name] [COLLATE collation_name]
MEDIUMTEXT [BINARY]
[CHARACTER SET charset_name] [COLLATE collation_name]
LONGTEXT [BINARY]
[CHARACTER SET charset_name] [COLLATE collation_name]
ENUM(value1,value2,value3,...)
[CHARACTER SET charset_name] [COLLATE collation_name]
SET(value1,value2,value3,...)
[CHARACTER SET charset_name] [COLLATE collation_name]
  
```

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> countries	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> departments	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> employees	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> jobs	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> job_history	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> locations	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> regions	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
7 tables	Sum	0	InnoDB	utf8mb4_general_ci	112.0 KiB	0 B

Unit 4: Delete Table

1. On the hr database, select SQL tab.
2. Write the following statement:
`DROP TABLE table_name;`
3. Click **Go**
4. Check the changes.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> departments	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> employees	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> jobs	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> job_history	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> locations	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> regions	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	16.0 KiB	-
6 tables	Sum	0	InnoDB	utf8mb4_general_ci	96.0 KiB	0 B

☐ Check all With selected:

I DELETE TABLE COUNTRIES

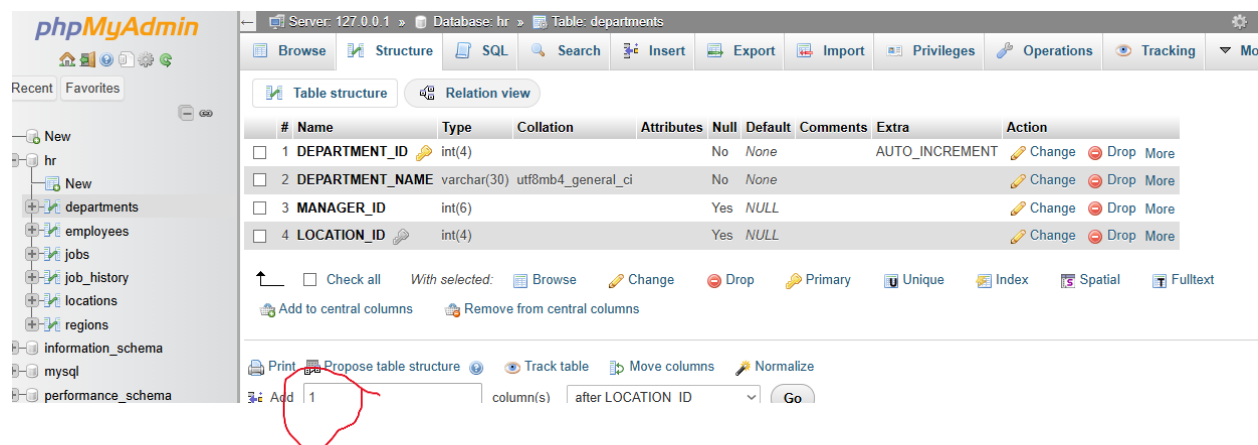
Unit 5: Update Tables

1. Use **ALTER** function to update table information/structure/constraints etc.
2. Example: Create Foreign Key constraints
This exercise allows you to create a constraint to a table by creating a primary – foreign key constraint.
3. To link the departments table and location table, we use foreign key concept.
4. Run SQL query/queries on database hr:
5. Write the following statement

```

ALTER TABLE departments
ADD CONSTRAINT FOREIGN KEY (LOCATION_ID)
REFERENCES departments (department_id) ON DELETE CASCADE on update cascade
  
```

6. Check the changes.



The screenshot shows the phpMyAdmin interface for the 'hr' database. The 'Table structure' view for the 'departments' table is displayed. The table structure is as follows:

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	DEPARTMENT_ID	int(4)			No	None		AUTO_INCREMENT	Change Drop More
2	DEPARTMENT_NAME	varchar(30)	utf8mb4_general_ci		No	None			Change Drop More
3	MANAGER_ID	int(6)			Yes	NULL			Change Drop More
4	LOCATION_ID	int(4)			Yes	NULL			Change Drop More

At the bottom of the table structure view, there is a section for adding new columns. A red circle highlights the 'Add' button in this section.

THIS HAPPENED
phpMyAdmin

The screenshot displays the phpMyAdmin interface for a MySQL database named 'hr'. The 'Table structure' view for the 'departments' table is active. The table structure shows four columns: DEPARTMENT_ID (int(4), primary key, auto-increment), DEPARTMENT_NAME (varchar(30)), MANAGER_ID (int(6)), and LOCATION_ID (int(4)). The 'Indexes' section shows a PRIMARY index on DEPARTMENT_ID and a BTREE index on LOCATION_ID.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	DEPARTMENT_ID	int(4)			No	None		AUTO_INCREMENT	Change Drop More
2	DEPARTMENT_NAME	varchar(30)	utf8mb4_general_ci		No	None			Change Drop More
3	MANAGER_ID	int(6)			Yes	NULL			Change Drop More
4	LOCATION_ID	int(4)			Yes	NULL			Change Drop More

Action	Keyname	Type	Unique	Packed	Column	Cardinality	Collation	Null	Comment
Edit Rename Drop	PRIMARY	BTREE	Yes	No	DEPARTMENT_ID	0	A	No	
Edit Rename Drop	LOCATION_ID	BTREE	No	No	LOCATION_ID	0	A	Yes	

Unit 6: Insert Data Into Tables

1. Use INSERT INTO command to insert data into tables.
2. Example; one record is inserted into *departments* table.
3. On the hr database, select SQL tab.
4. Write the following statement

```
INSERT INTO departments (DEPARTMENT_ID, DEPARTMENT_NAME)
VALUES (001, "Finance")
```

5. Check the changes. New data record is inserted in the *departments* table.

Options					
				DEPARTMENT_ID	DEPARTMENT_NAME
				1	Finance
					MANAGER_ID
					NULL
					LOCATION_ID
					NULL

6. Add 3 data in ALL the tables created in Unit 2.

DEPARTMENT

Server: 127.0.0.1 » Database: hr » Table: departments

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[SQL](#)
[Search](#)
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[Import](#)
[Privileges](#)
[Operations](#)
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Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM `departments`

☐ Profiling
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[\[Edit \]](#)
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[\[Create PHP code \]](#)
[\[Refresh \]](#)

☐ Show all
 Number of rows: 25
 Filter rows: Search this table
 Sort by key: None

Extra options

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
<input type="checkbox"/> Edit Copy Delete	1	FINANCE	NULL	NULL
<input type="checkbox"/> Edit Copy Delete	2	Luqieyyy	NULL	NULL
<input type="checkbox"/> Edit Copy Delete	3	Puteri	NULL	NULL

EMPLOYEES

phpmyadmin

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Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM `employees`

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☐ Show all
 Number of rows: 25
 Filter rows: Search this table

Extra options

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
1001	Ali	Rahman	ali.rahman@company.co	0123456789	2023-01-10	IT_PROG	4800.00	NULL	1000	80
1002	Siti	Nora	siti.nora@company.co	0198765432	2022-11-25	HR_REP	3500.00	NULL	1001	40
1003	Jason	Lim	jason.lim@company.co	0172233445	2024-03-05	SA_MAN	6200.00	0.10	1002	80

☐ Show all
 Number of rows: 25
 Filter rows: Search this table

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Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM `jobs`

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all Number of rows: 25 Filter rows: Search this table

Extra options

JOB_ID	JOB_TITLE	MIN_SALARY	DEPARTMENT_ID
IT_PROG	Programmer	4000	60
HR_REP	HR Representative	3200	40
SA_MAN	Sales Manager	5500	80

Show all Number of rows: 25 Filter rows: Search this table

Query results operations

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Label: ☐ Let every user access this bookmark

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phpMyAdmin

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Server: 127.0.0.1 Database: hr Table: job_history

Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM `job_history`

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all Number of rows: 25 Filter rows: Search this table

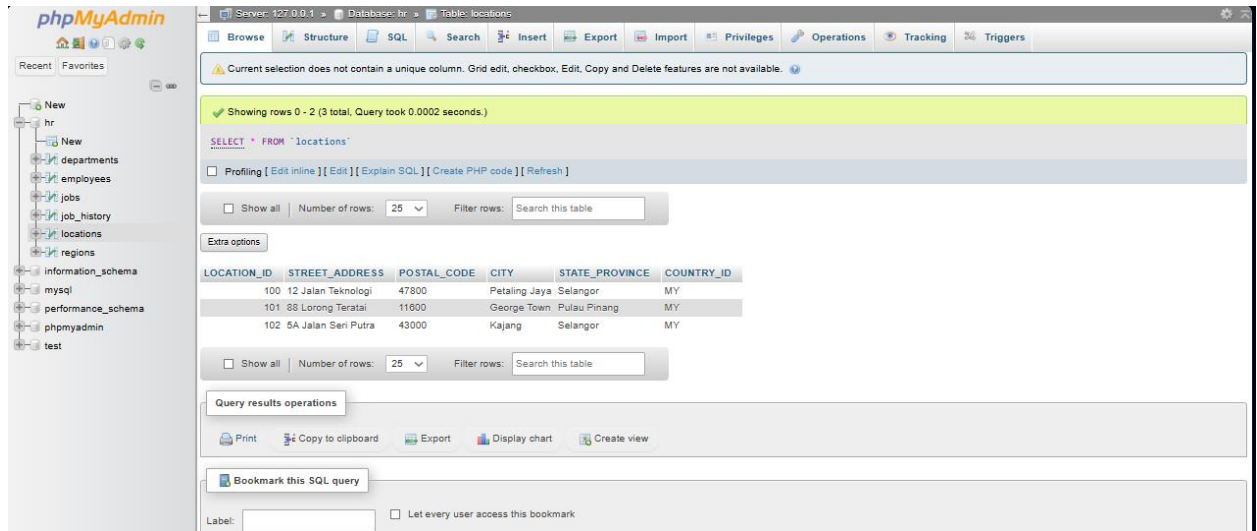
Extra options

EMPLOYEE_ID	START_DATE	END_DATE	JOB_ID	DEPARTMENT_ID
1001	2022-01-01	2022-12-31	HR_REP	40
1002	2021-06-15	2022-11-24	IT_PROG	60
1003	2023-01-01	2024-03-04	SA_MAN	80

Show all Number of rows: 25 Filter rows: Search this table

Query results operations

LOCATIONS



Server: 127.0.0.1 Database: hr Table: locations

Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM 'locations'

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table

Extra options

LOCATION_ID	STREET_ADDRESS	POSTAL_CODE	CITY	STATE_PROVINCE	COUNTRY_ID
100	12 Jalan Teknologi	47800	Petaling Jaya	Selangor	MY
101	88 Lorong Teratai	11600	George Town	Pulau Pinang	MY
102	5A Jalan Seri Putra	43000	Kajang	Selangor	MY

Show all | Number of rows: 25 | Filter rows: Search this table

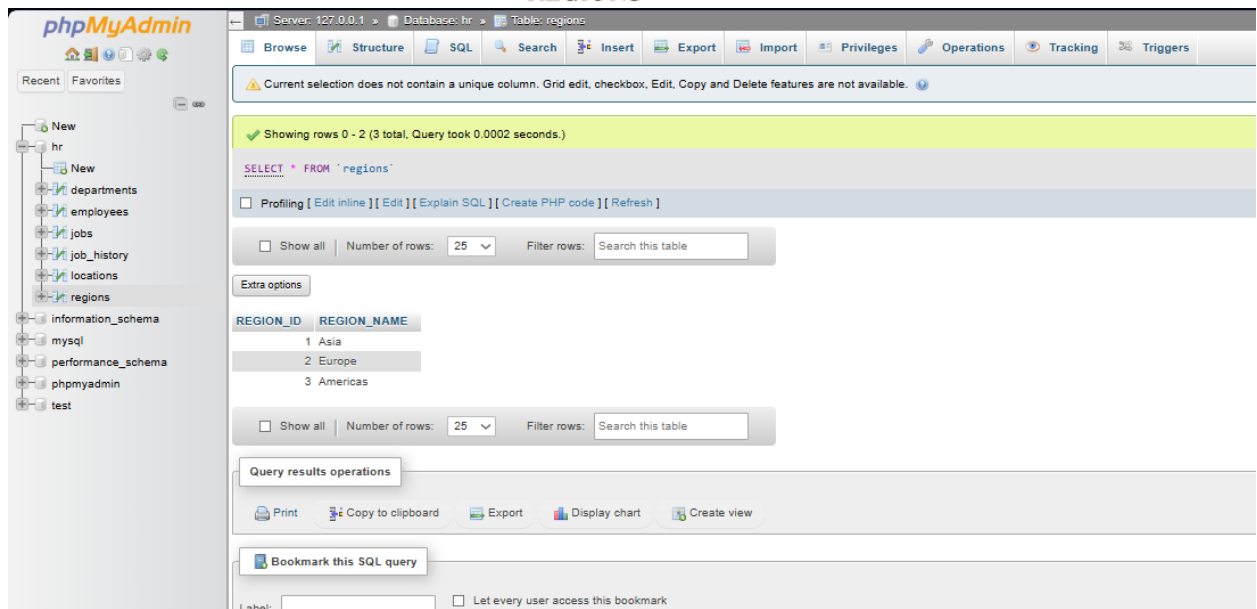
Query results operations

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REGIONS



Server: 127.0.0.1 Database: hr Table: regions

Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 2 (3 total, Query took 0.0002 seconds.)

SELECT * FROM 'regions'

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table

Extra options

REGION_ID	REGION_NAME
1	Asia
2	Europe
3	Americas

Show all | Number of rows: 25 | Filter rows: Search this table

Query results operations

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Bookmark this SQL query

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