Name-HARSHIT SELARKA
PRN-23070521131
BATCH-B2

Practical 3:

Part 5:

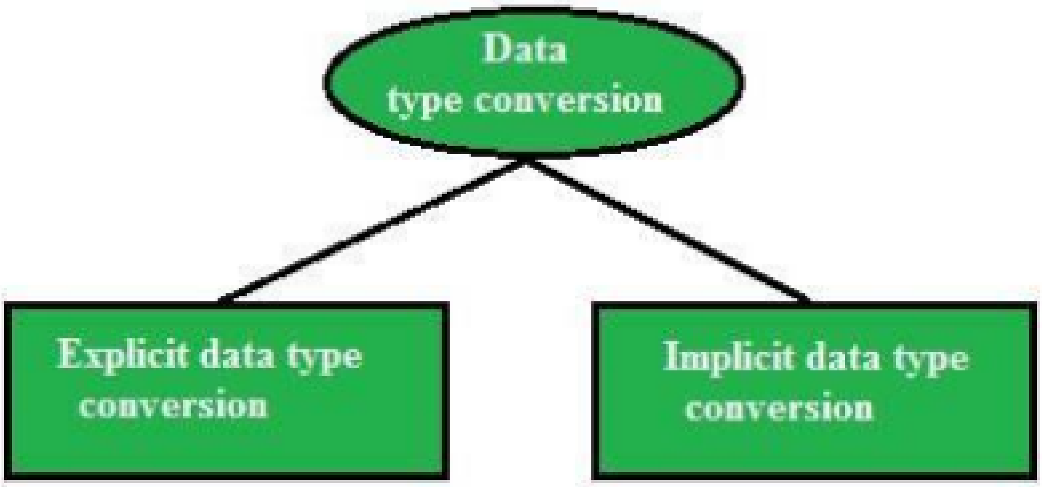
Conversion Function in SQL

In SQL **data type conversion** is important for effective **database management** and accurate query results. Data type conversion ensures that data from different sources or columns can be correctly interpreted and manipulated, especially when dealing with different formats like **numbers**, text, **dates**, and other data types.

Types of Data Type Conversion in SQL

There are two main types of data type conversion in SQL.

- **Implicit Data Type Conversion:** This is done automatically by the database management system (**DBMS**) when SQL operations involve columns of different data types. For instance, a **string** value might automatically be converted into a **numeric type** if required by a mathematical operation.
- **Explicit Data Type Conversion:** This is done by the user, who specifies the conversion. This is necessary when SQL cannot automatically convert between data types, or when more control over the conversion is needed.



1. Overview of Conversion Functions

Function	Oracle (SQL*Plus)	MySQL	Description
`TO_CHAR()`	Yes	❌ No	Converts a date/number to a string
`TO_DATE()`	Yes	❌ No	Converts a string to a date
`TO_NUMBER()`	Yes	❌ No	Converts a string to a number
`CAST()`	Yes	Yes	Converts from one data type to another
`CONVERT()`	❌ No	Yes	Converts string from one character set to another
`FORMAT()`	❌ No	Yes	Formats numbers with decimal places
`STR_TO_DATE ()`	❌ No	Yes	Converts a string to a date

DATE_FORMAT ()	❌ No	Yes	Formats a date as a string
TIME_FORMAT ()	❌ No	Yes	Formats time values
UNIX_TIMESTAMP()	❌ No	Yes	Converts a date to Unix timestamp
FROM_UNIXTIME()	❌ No	Yes	Converts Unix timestamp to a date

2. Conversion Functions in SQL*Plus (Oracle) /skip if you want to use mysql platform

Oracle provides TO_CHAR(), TO_DATE(), TO_NUMBER(), and CAST() for conversion.

2.1 TO_CHAR() – Convert Date/Number to String

Use Case: Format **date & time** into a human-readable string.

```
SELECT TO_CHAR(SYSDATE, 'YYYY-MM-DD HH24:MI:SS') AS
formatted_date FROM dual;
```

Output Example:

```
formatted_date
-------------------
2025-01-29 14:35:50
```

Format Number as Currency:

```
SELECT TO_CHAR(12345.67, 'L99,999.99') AS formatted_currency
FROM dual;
```

Output Example:

```
formatted_currency
------------------
$12,345.67
```

2.2 `TO_DATE()` – Convert String to Date

Use Case: Convert a **string** into a **date format**.

```
SELECT TO_DATE('2025-01-29', 'YYYY-MM-DD') AS converted_date
FROM dual;
```

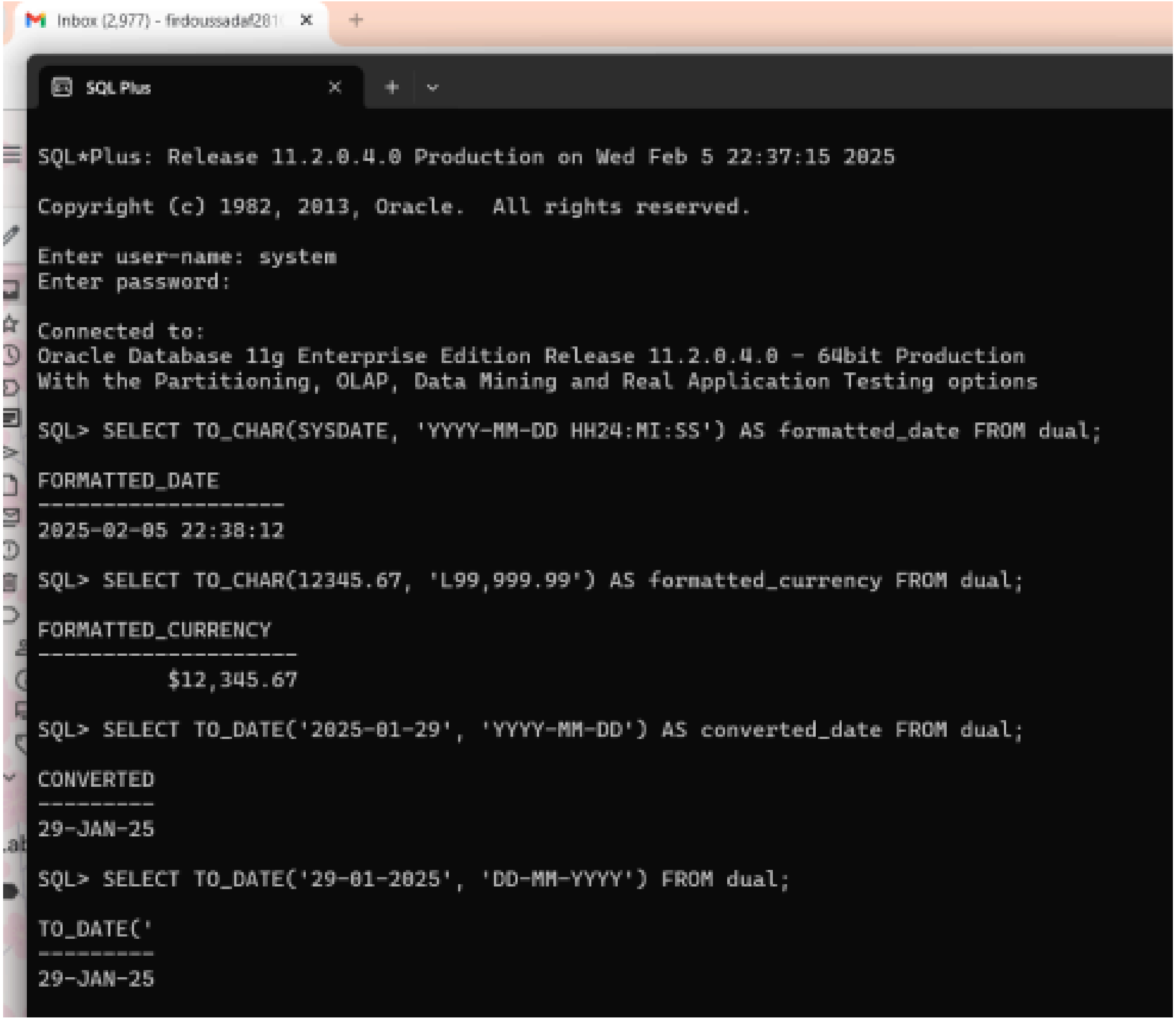
Output Example:

```
converted_date
---------------
29-JAN-25
```

Using Different Date Formats:

```
SELECT TO_DATE('29-01-2025', 'DD-MM-YYYY') FROM dual;
```

Sample output



```
SQL*Plus: Release 11.2.0.4.0 Production on Wed Feb 5 22:37:15 2025

Copyright (c) 1982, 2013, Oracle.  All rights reserved.

Enter user-name: system
Enter password:

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> SELECT TO_CHAR(SYSDATE, 'YYYY-MM-DD HH24:MI:SS') AS formatted_date FROM dual;

FORMATTED_DATE
-------------------
2025-02-05 22:38:12

SQL> SELECT TO_CHAR(12345.67, 'L99,999.99') AS formatted_currency FROM dual;

FORMATTED_CURRENCY
--------------------
          $12,345.67

SQL> SELECT TO_DATE('2025-01-29', 'YYYY-MM-DD') AS converted_date FROM dual;

CONVERTED
---------
29-JAN-25

SQL> SELECT TO_DATE('29-01-2025', 'DD-MM-YYYY') FROM dual;

TO_DATE('
---------
29-JAN-25
```

2.3 `TO_NUMBER()` – Convert String to Number

Use Case: Convert a **string** containing numbers into a **numeric type**.

```
SELECT TO_NUMBER('12345.67') AS number_value FROM dual;
```

Output Example:

```
number_value

------------

12345.67
```

2.4 `CAST()` – Convert Data Types

Use Case: Convert a number to a string or vice versa.

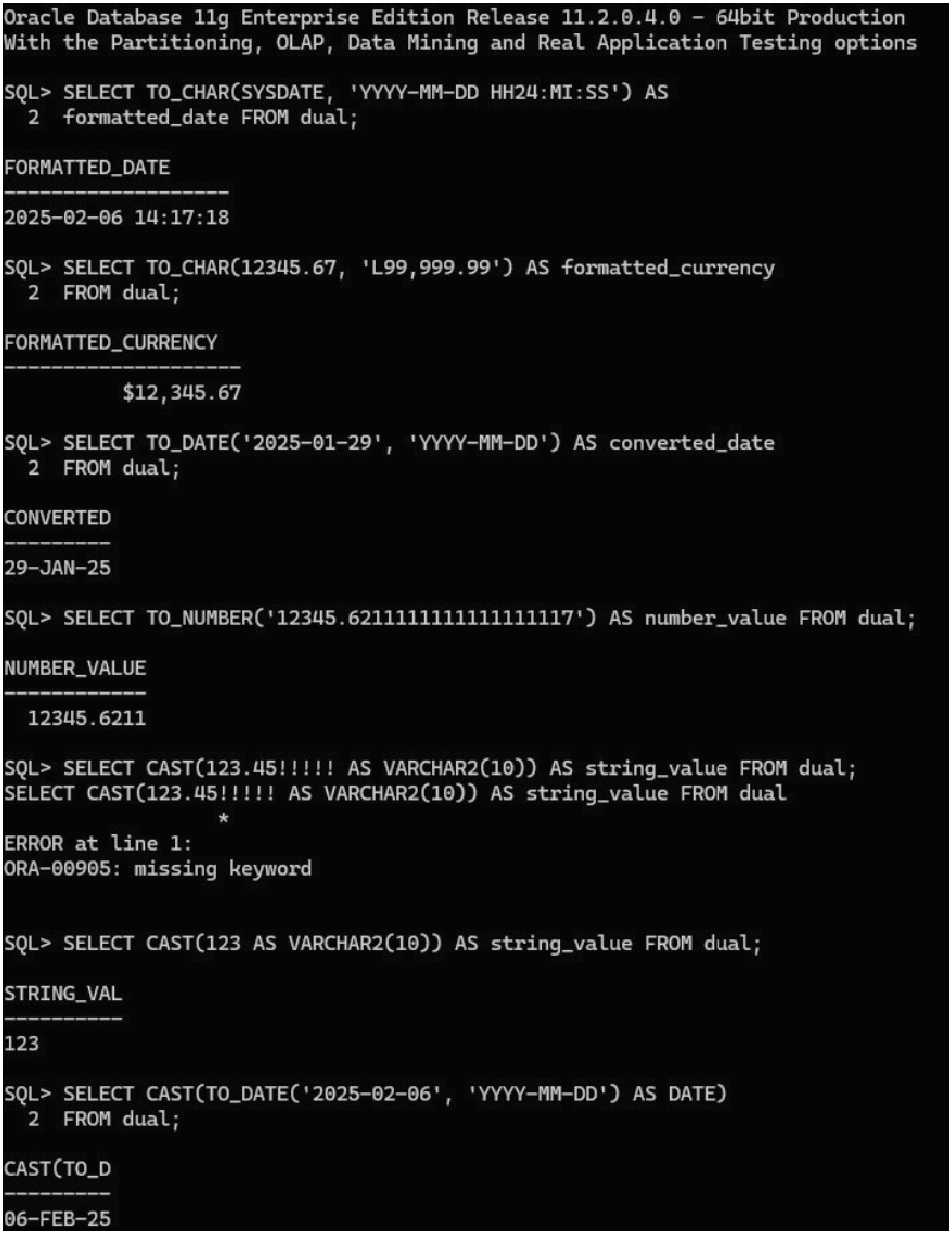
```
SELECT CAST(123.45 AS VARCHAR2(10)) AS string_value FROM
dual;
```

Output Example:

```
string_value
------------
123.45
```

Convert String to Date:

```
SELECT CAST(TO_DATE('2025-01-29', 'YYYY-MM-DD') AS DATE)
FROM dual;
```



```
Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> SELECT TO_CHAR(SYSDATE, 'YYYY-MM-DD HH24:MI:SS') AS
  2  formatted_date FROM dual;

FORMATTED_DATE
-------------------
2025-02-06 14:17:18

SQL> SELECT TO_CHAR(12345.67, 'L99,999.99') AS formatted_currency
  2  FROM dual;

FORMATTED_CURRENCY
--------------------
          $12,345.67

SQL> SELECT TO_DATE('2025-01-29', 'YYYY-MM-DD') AS converted_date
  2  FROM dual;

CONVERTED
---------
29-JAN-25

SQL> SELECT TO_NUMBER('12345.621111111111111117') AS number_value FROM dual;

NUMBER_VALUE
------------
  12345.6211

SQL> SELECT CAST(123.45!!!!! AS VARCHAR2(10)) AS string_value FROM dual;
SELECT CAST(123.45!!!!! AS VARCHAR2(10)) AS string_value FROM dual
                  *
ERROR at line 1:
ORA-00905: missing keyword


SQL> SELECT CAST(123 AS VARCHAR2(10)) AS string_value FROM dual;

STRING_VAL
----------
123

SQL> SELECT CAST(TO_DATE('2025-02-06', 'YYYY-MM-DD') AS DATE)
  2  FROM dual;

CAST(TO_D
---------
06-FEB-25
```

3. Conversion Functions in MySQL //SKIP IF DONE WITH ORACLE SQLPLUS

MySQL provides `CAST()`, `CONVERT()`, `STR_TO_DATE()`, `DATE_FORMAT()`, etc.

3.1 `CAST()` – Convert Data Types

Use Case: Convert an integer to a **string**.

```
SELECT CAST(12345 AS CHAR) AS string_value;
```

Output Example:

diff

```
string_value
------------
12345
```

Convert a String to an Integer:

```
SELECT CAST('12345' AS SIGNED) AS number_value;
```

3.2 `CONVERT()` – Convert Between Character Sets

Use Case: Change **character encoding**.

```
SELECT CONVERT('Héllo' USING utf8mb4) AS utf8_text;
```

Convert a Number to String:

```
SELECT CONVERT(12345, CHAR) AS string_value;
```

3.3 `FORMAT()` – Format Number with Commas

Use Case: Display **large numbers with commas**.

```
SELECT FORMAT(1234567.89, 2) AS formatted_number;
```

Output Example:

diff

```
formatted_number
----------------
```

```
1,234,567.89
```

3.4 `STR_TO_DATE()` – Convert String to Date

Use Case: Convert **string into date format**.

```
SELECT STR_TO_DATE('29-01-2025', '%d-%m-%Y') AS
converted_date;
```

Output Example:

diff

```
converted_date
---------------
2025-01-29
```

3.5 `DATE_FORMAT()` – Format a Date as a

String Use Case: Display **formatted dates**.

```
SELECT DATE_FORMAT(NOW(), '%W, %M %d, %Y') AS
formatted_date;
```

Output Example:

diff

```
formatted_date
-----------------------
Tuesday, January 29, 2025
```

3.6 `TIME_FORMAT()` – Format Time

Use Case: Convert **24-hour time** into **12-hour format**.

```
SELECT TIME_FORMAT('14:35:50', '%h:%i %p') AS
formatted_time;
```

Output Example:

diff

```
formatted_time
---------------
02:35 PM
```

3.7 `UNIX_TIMESTAMP()` – Convert Date to Unix

Timestamp Use Case: Store dates as **timestamps**.

```
SELECT UNIX_TIMESTAMP('2025-01-29 14:35:50') AS unix_time;
```

Output Example:

```
unix_time
----------
1740792950
```

3.8 `FROM_UNIXTIME()` – Convert Unix Timestamp to

Date Use Case: Convert **timestamps** back to a **date**.

```
SELECT FROM_UNIXTIME(1740792950) AS converted_date;
```

Output Example:

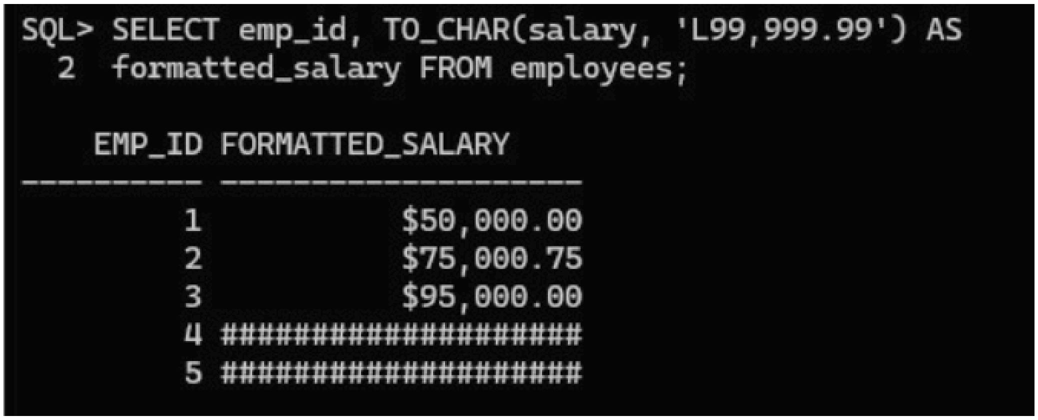
```
converted_date
---------------
2025-01-29 14:35:50
```

4. Real-World Use Cases of Conversion Functions

Financial Data Reporting

Convert salary figures into **formatted currency**.

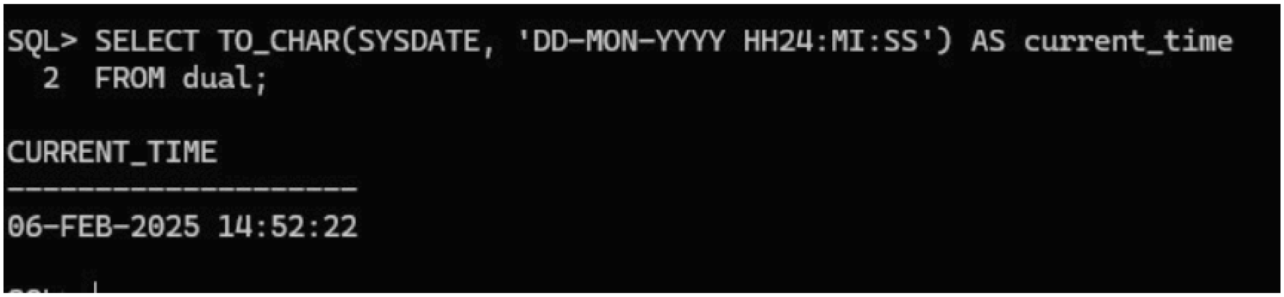
```
SELECT emp_id, TO_CHAR(salary, 'L99,999.99') AS
formatted_salary FROM employees;
```



```
SQL> SELECT emp_id, TO_CHAR(salary, 'L99,999.99') AS
  2  formatted_salary FROM employees;

    EMP_ID FORMATTED_SALARY
---------- --------------------
         1           $50,000.00
         2           $75,000.75
         3           $95,000.00
         4 ####################
         5 ####################
```

Log Analysis (MySQL)

Convert timestamps into **human-readable format**.



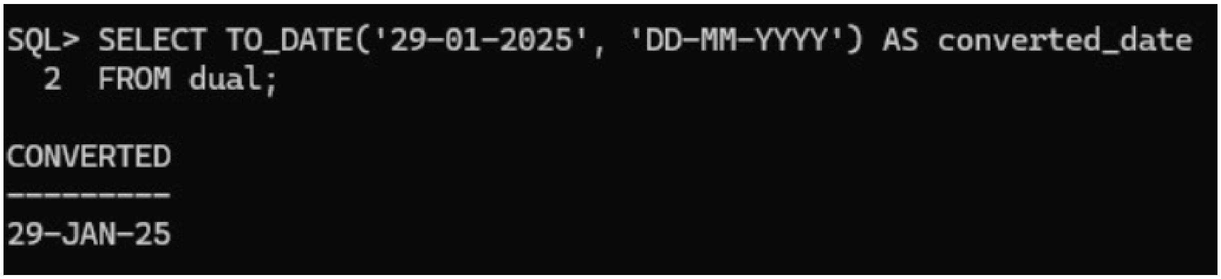
```
SQL> SELECT TO_CHAR(SYSDATE, 'DD-MON-YYYY HH24:MI:SS') AS current_time
  2  FROM dual;

CURRENT_TIME
--------------------
06-FEB-2025 14:52:22
```

```
SELECT FROM_UNIXTIME(UNIX_TIMESTAMP()) AS current_time;
```

Data Migration

When migrating from **CSV files**, convert **strings to dates**.

```
SELECT STR_TO_DATE('29-01-2025', '%d-%m-%Y') AS
converted_date;
```



```
SQL> SELECT TO_DATE('29-01-2025', 'DD-MM-YYYY') AS converted_date
  2  FROM dual;

CONVERTED
---------
29-JAN-25
```

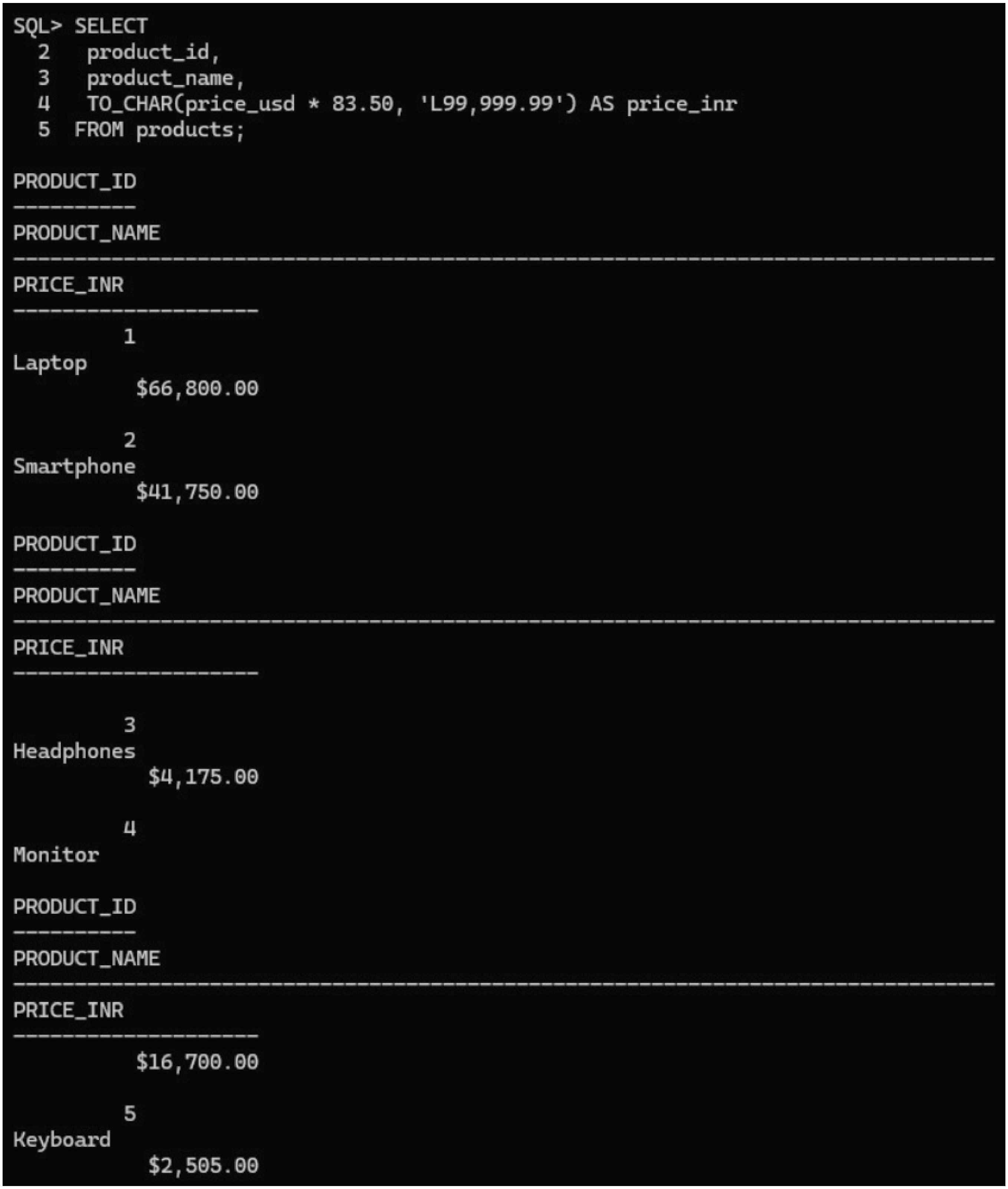
5. Summary Table

Function	Oracle (SQL*Plus)	MySQ L	Purpose
`TO_CHAR()`	Yes	❌ No	Convert date/number to string
`TO_DATE()`	Yes	❌ No	Convert string to date
`TO_NUMBER( )`	Yes	❌ No	Convert string to number
`CAST()`	Yes	Yes	Convert between data types
`CONVERT()`	❌ No	Yes	Convert between character sets
`FORMAT()`	❌ No	Yes	Format number with commas

`STR_TO_DATE()`	❌ No	Yes	Convert string to date
`DATE_FORMAT()`	❌ No	Yes	Format a date as a string
`TIME_FORMAT()`	❌ No	Yes	Format time values
`UNIX_TIMESTAMP()`	❌ No	Yes	Convert date to Unix timestamp
`FROM_UNIXTIME()`	❌ No	Yes	Convert Unix timestamp to date

Advanced Real-World Use Cases of Conversion Functions in MySQL & SQL*Plus (Oracle)

1️⃣E-Commerce: Converting Prices for Different Currencies



```
SQL> SELECT
      product_id,
      product_name,
      TO_CHAR(price_usd * 83.50, 'L99,999.99') AS price_inr
     FROM products;

PRODUCT_ID
----------
PRODUCT_NAME
--------------------------------------------------------------------------------
PRICE_INR
--------------------
         1
Laptop
          $66,800.00

         2
Smartphone
          $41,750.00

PRODUCT_ID
----------
PRODUCT_NAME
--------------------------------------------------------------------------------
PRICE_INR
--------------------


         3
Headphones
           $4,175.00

         4
Monitor

PRODUCT_ID
----------
PRODUCT_NAME
--------------------------------------------------------------------------------
PRICE_INR
--------------------
          $16,700.00

         5
Keyboard
           $2,505.00
```

Scenario: An e-commerce site needs to convert prices from USD to INR and format them properly.

Oracle (SQL*Plus):

```
SELECT
 product_id,
 product_name,
 TO_CHAR(price_usd * 83.50, 'L99,999.99') AS price_inr
FROM products;
```

MySQL:

```
SELECT
 product_id,
 product_name,
 FORMAT(price_usd * 83.50, 2) AS price_inr
FROM products;
```

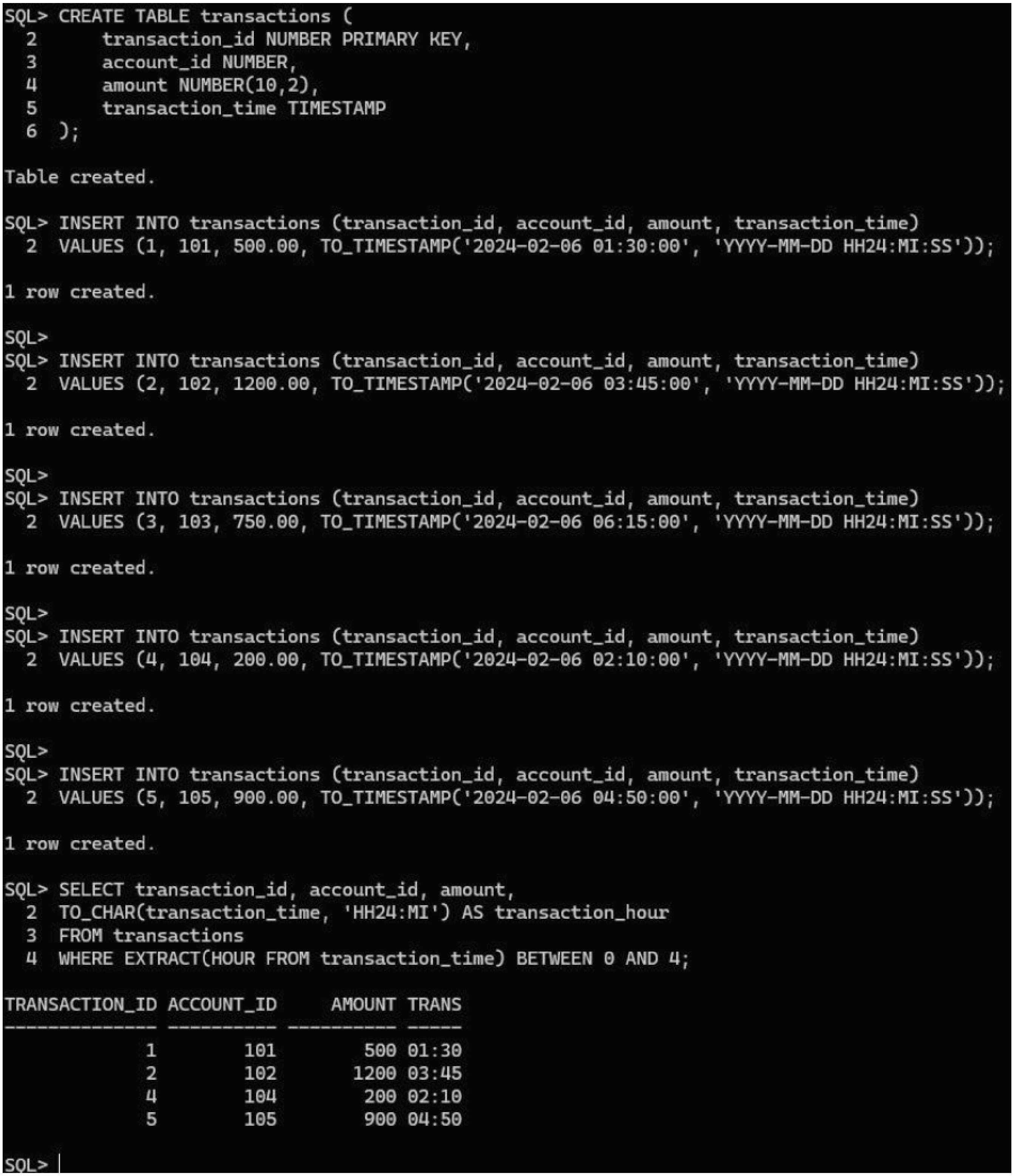
Why?

- Uses `TO_CHAR()` in Oracle and `FORMAT()` in MySQL to **add currency formatting**.
- 1 USD = **83.50 INR** (exchange rate example).

Example Output:

product_id	product_name	price_inr
101	iPhone 15	₹99,999.99
202	MacBook Pro	₹2,19,999.99

2 Banking: Detecting Fraudulent Transactions Using Da Conversions



```
SQL> CREATE TABLE transactions (
         transaction_id NUMBER PRIMARY KEY,
         account_id NUMBER,
         amount NUMBER(10,2),
         transaction_time TIMESTAMP
     );

Table created.

SQL> INSERT INTO transactions (transaction_id, account_id, amount, transaction_time)
     VALUES (1, 101, 500.00, TO_TIMESTAMP('2024-02-06 01:30:00', 'YYYY-MM-DD HH24:MI:SS'));

1 row created.

SQL>
SQL> INSERT INTO transactions (transaction_id, account_id, amount, transaction_time)
     VALUES (2, 102, 1200.00, TO_TIMESTAMP('2024-02-06 03:45:00', 'YYYY-MM-DD HH24:MI:SS'));

1 row created.

SQL>
SQL> INSERT INTO transactions (transaction_id, account_id, amount, transaction_time)
     VALUES (3, 103, 750.00, TO_TIMESTAMP('2024-02-06 06:15:00', 'YYYY-MM-DD HH24:MI:SS'));

1 row created.

SQL>
SQL> INSERT INTO transactions (transaction_id, account_id, amount, transaction_time)
     VALUES (4, 104, 200.00, TO_TIMESTAMP('2024-02-06 02:10:00', 'YYYY-MM-DD HH24:MI:SS'));

1 row created.

SQL>
SQL> INSERT INTO transactions (transaction_id, account_id, amount, transaction_time)
     VALUES (5, 105, 900.00, TO_TIMESTAMP('2024-02-06 04:50:00', 'YYYY-MM-DD HH24:MI:SS'));

1 row created.

SQL> SELECT transaction_id, account_id, amount,
     TO_CHAR(transaction_time, 'HH24:MI') AS transaction_hour
     FROM transactions
     WHERE EXTRACT(HOUR FROM transaction_time) BETWEEN 0 AND 4;

TRANSACTION_ID ACCOUNT_ID     AMOUNT TRANS
-------------- ---------- ---------- -----
             1        101        500 01:30
             2        102       1200 03:45
             4        104        200 02:10
             5        105        900 04:50

SQL>
```

Scenario: A bank flags **suspicious transactions** that happened at **odd hours**

(midnight to 4 AM).

Oracle (SQL*Plus):

```
SELECT transaction_id, account_id, amount,
TO_CHAR(transaction_time, 'HH24:MI') AS transaction_hour
FROM transactions
WHERE EXTRACT(HOUR FROM transaction_time) BETWEEN 0 AND 4;
```

MySQL:

```
SELECT transaction_id, account_id, amount,
TIME_FORMAT(transaction_time, '%H:%i') AS transaction_hour
FROM transactions
WHERE HOUR(transaction_time) BETWEEN 0 AND 4;
```

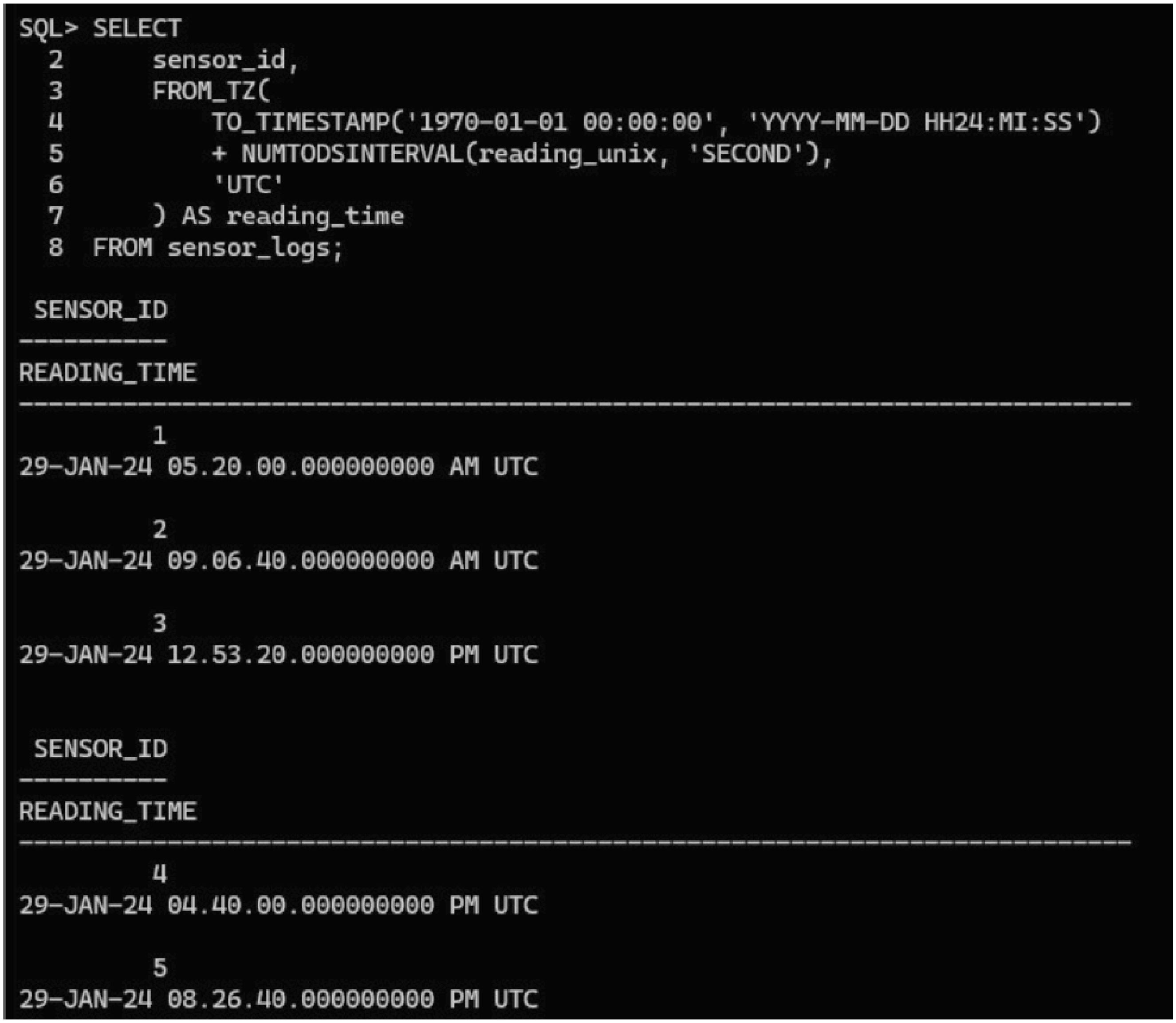
Why?

- Uses `TO_CHAR()` (Oracle) and `TIME_FORMAT()` (MySQL) to **extract and format time**.
- Filters transactions **between 00:00 and 04:00**.

Example Output:

transaction_id	account_id	amount	transaction_hour
89234	123456	5000	02:30
97345	789012	25000	03:15

3️⃣IoT & Smart Devices: Storing and Retrieving Un Timestamps



```
SQL> SELECT
         sensor_id,
         FROM_TZ(
             TO_TIMESTAMP('1970-01-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS')
             + NUMTODSINTERVAL(reading_unix, 'SECOND'),
             'UTC'
         ) AS reading_time
     FROM sensor_logs;

 SENSOR_ID
----------
READING_TIME
---------------------------------------------------------------------------
         1
29-JAN-24 05.20.00.000000000 AM UTC

         2
29-JAN-24 09.06.40.000000000 AM UTC

         3
29-JAN-24 12.53.20.000000000 PM UTC


 SENSOR_ID
----------
READING_TIME
---------------------------------------------------------------------------
         4
29-JAN-24 04.40.00.000000000 PM UTC

         5
29-JAN-24 08.26.40.000000000 PM UTC
```

Scenario: A smart home system stores **sensor readings** as Unix timestamps and needs human-readable timestamps.

Oracle (SQL*Plus) - Convert Unix Timestamp to Readable Date:

```
SELECT sensor_id, FROM_TZ(TO_TIMESTAMP(1706505600), 'UTC')
AS reading_time FROM sensor_logs;
```

MySQL:

```
SELECT sensor_id, FROM_UNIXTIME(1706505600) AS reading_time
FROM sensor_logs;
```

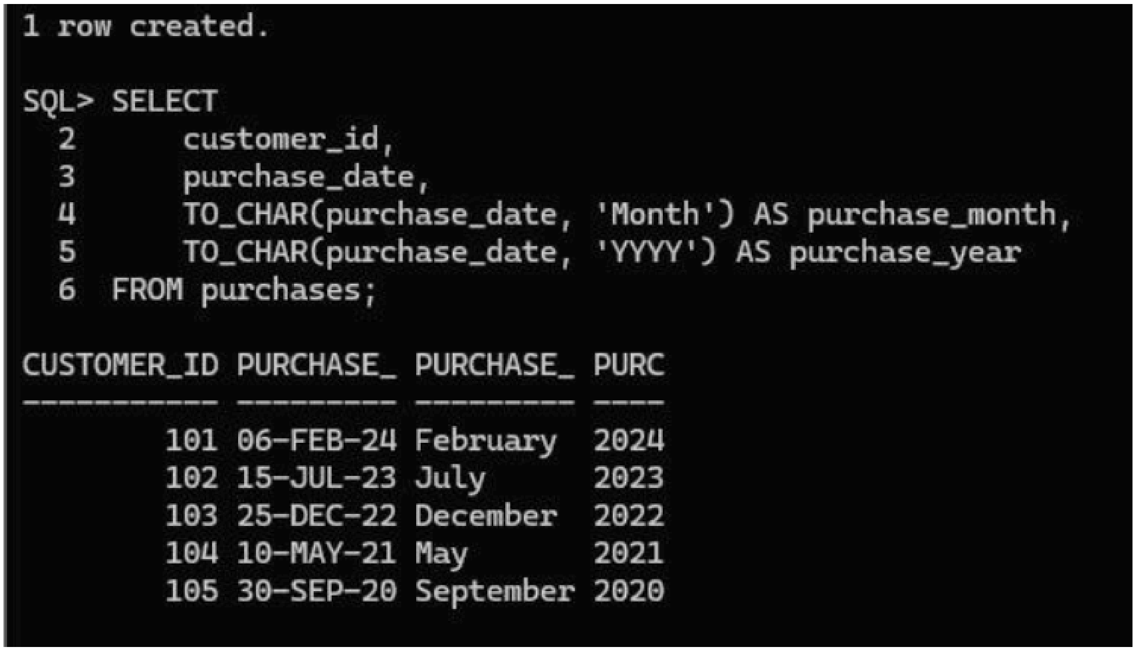
Why?

- Converts `1706505600` (Unix timestamp) into a **readable date-time format**.

Example Output:

sensor_id	reading_time
101	2025-01-29 12:00:00

4️⃣Marketing Analytics: Extracting Month and Year fr Dates



```
1 row created.

SQL> SELECT
             customer_id,
             purchase_date,
             TO_CHAR(purchase_date, 'Month') AS purchase_month,
             TO_CHAR(purchase_date, 'YYYY') AS purchase_year
         FROM purchases;

CUSTOMER_ID PURCHASE_ PURCHASE_ PURC
----------- --------- --------- ----
        101 06-FEB-24 February  2024
        102 15-JUL-23 July      2023
        103 25-DEC-22 December  2022
        104 10-MAY-21 May       2021
        105 30-SEP-20 September 2020
```

Scenario: A company wants to analyze customer purchases by **month and year**.

Oracle (SQL*Plus):

```
SELECT
 customer_id,
 purchase_date,
 TO_CHAR(purchase_date, 'Month') AS purchase_month,
TO_CHAR(purchase_date, 'YYYY') AS purchase_year FROM
purchases;
```

MySQL:

```
SELECT
 customer_id,
 purchase_date,
 DATE_FORMAT(purchase_date, '%M') AS purchase_month,
DATE_FORMAT(purchase_date, '%Y') AS purchase_year FROM
purchases;
```

Why?

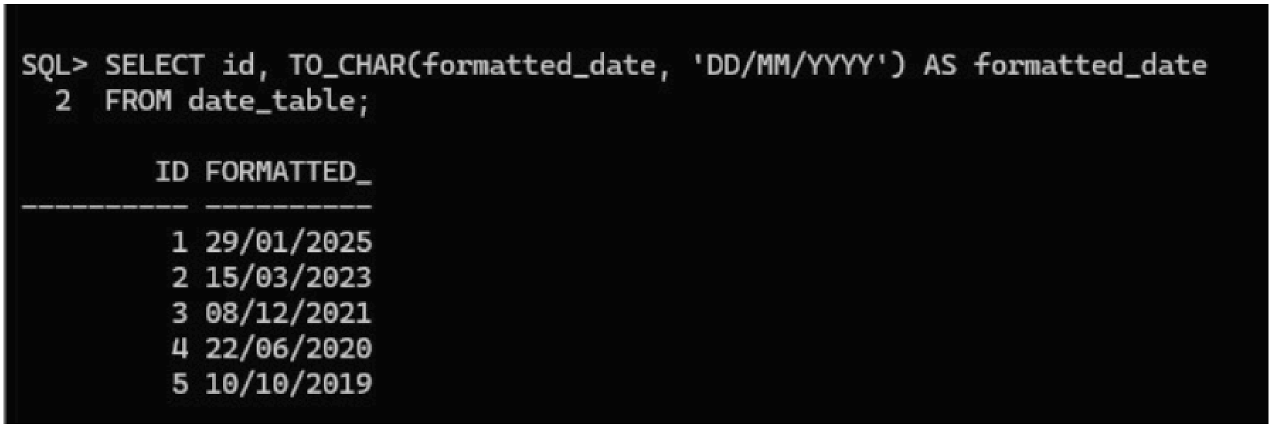
- Uses `TO_CHAR()` (Oracle) and `DATE_FORMAT()` (MySQL) to extract **month and year** from a **purchase date.**

Example Output:

customer_id purchase_date purchase_month purchase_year 501

2025-01-29 January 2025

5️⃣Data Migration: Converting String Dates into Proper Da Format



```
SQL> SELECT id, TO_CHAR(formatted_date, 'DD/MM/YYYY') AS formatted_date
  2  FROM date_table;

        ID FORMATTED_
---------- ----------
         1 29/01/2025
         2 15/03/2023
         3 08/12/2021
         4 22/06/2020
         5 10/10/2019
```

Scenario: A company migrating old **CSV data** where dates are stored as strings (`DD/MM/YYYY`).

Oracle (SQL*Plus):

```
SELECT TO_DATE('29/01/2025', 'DD/MM/YYYY') AS formatted_date
FROM dual;
```

MySQL:

```
SELECT STR_TO_DATE('29/01/2025', '%d/%m/%Y') AS
formatted_date;
```

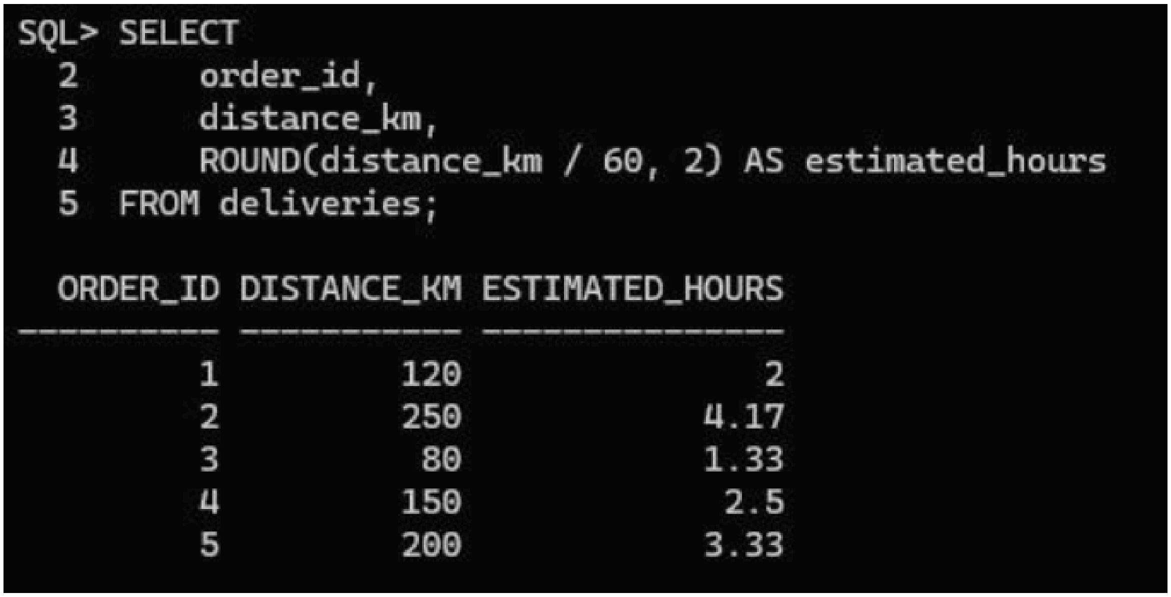
Why?

- Converts `29/01/2025` (string) into a **date type** in Oracle (`TO_DATE()`) and MySQL (`STR_TO_DATE()`).

Example Output:

formatted_date
2025-01-29

6️⃣Logistics & Delivery: Calculating Expected Delivery Ti Based on Distance



```
SQL> SELECT
         order_id,
         distance_km,
         ROUND(distance_km / 60, 2) AS estimated_hours
     FROM deliveries;

  ORDER_ID DISTANCE_KM ESTIMATED_HOURS
---------- ----------- ---------------
         1         120               2
         2         250            4.17
         3          80            1.33
         4         150             2.5
         5         200            3.33
```

Scenario: Estimate delivery **ETA** based on **distance traveled** and **average speed**.

Oracle (SQL*Plus):

```
SELECT
```

```
 order_id,
 distance_km,
 ROUND(distance_km / 60, 2) AS estimated_hours
FROM deliveries;
```

MySQL:

```
SELECT
 order_id,
 distance_km,
 FORMAT(distance_km / 60, 2) AS estimated_hours
FROM deliveries;
```

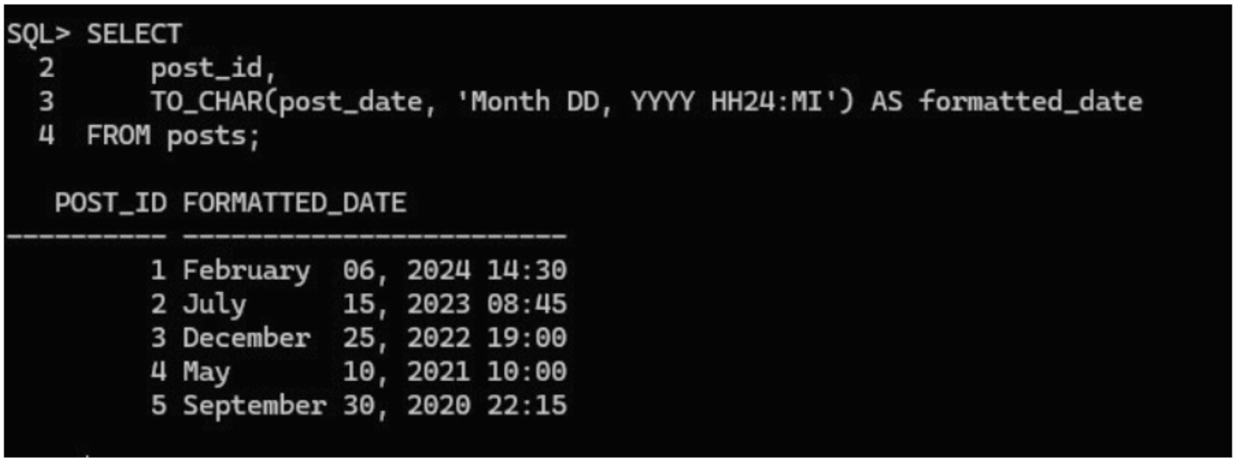
Why?

- Divides `distance_km` by `60 km/h` (average speed).

Example Output:

order_id	distance_km	estimated_hours
1001	120	2.00

7️⃣Social Media Analytics: Converting Post Dates in Readable Formats



```
SQL> SELECT
       post_id,
       TO_CHAR(post_date, 'Month DD, YYYY HH24:MI') AS formatted_date
     FROM posts;

   POST_ID FORMATTED_DATE
---------- ------------------------
         1 February  06, 2024 14:30
         2 July      15, 2023 08:45
         3 December  25, 2022 19:00
         4 May       10, 2021 10:00
         5 September 30, 2020 22:15
```

Scenario: A social media platform needs to display post timestamps **beautifully**.

Oracle (SQL*Plus):

```
SELECT post_id, TO_CHAR(post_date, 'Month DD, YYYY HH24:MI')
AS formatted_date FROM posts;
```

MySQL:

```
SELECT post_id, DATE_FORMAT(post_date, '%M %d, %Y %H:%i') AS
formatted_date FROM posts;
```

Why?

- Converts **date into a social-media friendly format**.

Example Output:

post_id	formatted_date
555	January 29, 2025 14:35

Summary Table

Scenario	Oracle (SQL*Plus)	MySQL
Convert prices to INR	`TO_CHAR(price, 'L99,999.99')`	`FORMAT(price, 2)`
Detect fraud based on time	`EXTRACT(HOUR FROM transaction_time)`	`HOUR(transaction_tim e)`
Convert Unix timestamp	`FROM_TZ(TO_TIMESTAMP( ...), 'UTC')`	`FROM_UNIXTIME(...)`
Extract month & year	`TO_CHAR(date, 'Month YYYY')`	`DATE_FORMAT(date, '%M %Y')`
Convert string to date	`TO_DATE('29/01/2025', 'DD/MM/YYYY')`	`STR_TO_DATE('29/01/2 025', '%d/%m/%Y')`
Estimate delivery ETA	`ROUND(distance_km / 60, 2)`	`FORMAT(distance_km / 60, 2)`
Format social media timestamps	`TO_CHAR(post_date, 'Month DD, YYYY HH24:MI')`	`DATE_FORMAT(post_dat e, '%M %d, %Y %H:%i')`