New Test Cases

We have created three new test cases as described below. We have submitted the following pull request: https://github.com/h2database/h2database/pull/2513

Test Case 1:

This test case was added to the h2/test/scripts/datatypes/int.sql file. Here we are checking if the invalid casting of a character value as integer throws a Data Conversion exception.

```
--Data conversion
SELECT CAST('A' AS INT);
> exception DATA_CONVERSION_ERROR_1
```

Test Case 2:

The following test case was added to file h2/test/db/TestViewAlterTable.java. In this test case, we are checking if the application is throwing referential integrity constraint violation error.

```
private void testForeignKeyWithReferentialIntegrityConstraintViolation() throws SQLException {
    stat.execute( sql: "create table testPrimary(a int primary key, b int)");
    stat.execute( sql: "create table testForeign(x int primary key, y int, foreign key (y) references testPrimary(a))");
    stat.execute( sql: "insert into testPrimary(a, b) values (1, 1), (2, 2)");

    // should throw referential integrity constraint violation error
    assertThrows(ErrorCode.REFERENTIAL_INTEGRITY_VIOLATED_PARENT_MISSING_1, stat).execute( sql: "insert into testForeign(x, y) values (1, 10)");
}
```

In this test case, we created two tables testPrimary and testForeign, where testForeign had a foreign key column which referred to the primary key column in the testPrimary table. We then added values to the foreign key column that are not present in the primary key

column that it refers to and then checked that executing this insertion statement threw a referential integrity violation error.

This test case was run and executed successfully.

Test Case 3:

The following test case was added to file h2/test/db/TestIndex.java.

```
private void testAddNullToPrimaryKey() throws SQLException {
    reconnect();
    stat.execute( sql: "create table test(a int primary key)");
    assertThrows(ErrorCode.NULL_NOT_ALLOWED, stat).execute( sql: "insert into test(a) values (null)");
}
```

To test this, we created a new table with just a single primary key column in it. Then we added null value to this table and checked if it threw null not allowed error while executing this statement.

This test case was successfully run and executed.

Experience

We were surprised to see that there were several missing edge cases that were not covered by the existing test suite. It's surprising because, given the complexity of this project, and the meticulous nature of the developers and maintainers(so far from what we have seen), it seemed almost unlikely that they would miss an edge case. Even though there are multiple test cases that test different aspects of SQL queries like CREATE TABLE, SELECT, INSERT etc we couldn't find particular test cases that specifically target the respective SQL error codes like referential integrity constraint violation, null not allowed (Test cases 2 and 3) or any specific test case that checks the invalid CAST operation for a CHAR value to INTEGER type (Test case 1).

It was also quite interesting to see that test cases are not written conventionally. Each test case was testing one functionality, and some tests were performed by running SQL statements and verifying the expected output where both the input SQL statements and

the expected output are specified in the SQL script files which are in turn being executed from the Java methods.

We also understood that h2 has a class that defines custom error codes used for SQL exceptions like referential integrity constraint violation, duplicate column names, etc.