Constraints in Detail!

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This one implementation encompasses everything we have learned so far.

Tables:

- school_20BBS0122
- stream_20BBS0122
- student_20BBS0122

Attributes of school_20BBS0122:

school_id number	Primary Key
school_name varchar2(10)	check that its length is not lesser than 3 characters (to make sure it is descriptive). The school name should also be unique. This must be a table level constraint
num_faculty number	Default number of professors is 0

Attributes of stream_20BBS0122:

stream_id number	Primary Key
stream_name varchar2(10)	The stream name must be unique and cannot be null.
num_courses number	-

Attributes of student_20BBS0122:

student_id varchar2(10)	primary key
name varchar2(10)	Cannot be null
year_of_joining number	Length has to be 4
school_id number	Foreign Key derived from school_20BBS0122 table. Column level constraint
stream_id number	Foreign Key derived from stream_20BBS0122 table. Table level constraint.

Tasks:

1) Define these tables and add the constraints using both table level and column level constraints. Add values to these tables.
2) At least 5 courses should be there for each stream, so change the appropriate table accordingly.
3) Rahul (19CSE0134) decided to pursue his passion and changed his stream to Astrophysics from CSE. Update the records accordingly.
4) Students who joined in 2017 have graduated, so delete their records from the database.
5) The Chemical Engineering stream and its students have been shifted to another campus, so delete all related records (using On Delete Cascade).
6) The school of nanoscience has been merged into the physics department. Delete the nanoscience department and update the student records. (change foreign key constraint to account for - On Delete Set Null).

Task 1:

Define these tables and add the constraints using both table level and column level constraints. Add values to these tables.

```
SQL> create table school_20BBS0122(
  2  school_id number primary key,
  3  school_name varchar2(30),
  4  num_faculty number default 0,
  5  constraint student_school_name_check check (length(school_name) >= 3 ),
  6  constraint student_school_name_unique unique(school_name) );

Table created.

SQL> create table stream_20BBS0122(
  2  stream_id number primary key,
  3  stream_name varchar2(30) unique not null,
  4  num_courses number );

Table created.

SQL> create table student_20BBS0122(
  2  student_id varchar2(20) primary key,
  3  name varchar2(30) not null,
  4  year_of_joining number constraint student_year_of_join_check check ( length(year_of_joining) = 4 ),
  5  school_id number references school_20BBS0122,
  6  stream_id number,
  7  constraint student_stream_id_fr foreign key(stream_id) references stream_20BBS0122(stream_id)
  8  on delete cascade );

Table created.
```

```
SQL> insert into school_20BBS0122 values(100, 'SCOPE', 20);

1 row created.

SQL> insert into school_20BBS0122 values(101, 'SELECT', 17);

1 row created.

SQL> insert into school_20BBS0122 values(102, 'Physics', 12);

1 row created.

SQL> insert into school_20BBS0122 values(103, 'Nanoscience', 4);

1 row created.

SQL> insert into school_20BBS0122 values(104, 'Chemical Sciences', 18);

1 row created.
```

```
SQL> insert into stream_20BBS0122 values(1014, 'CSE', 56);

1 row created.

SQL> insert into stream_20BBS0122 values(1015, 'CSE + Business Systems', 32);

1 row created.

SQL> insert into stream_20BBS0122 values(1016, 'CSE + Cybersecurity', 15);

1 row created.

SQL> insert into stream_20BBS0122 values(1017, 'CSE + IoT', 25);

1 row created.

SQL> insert into stream_20BBS0122 values(1018, 'Chemical Engineering', 34);

1 row created.

SQL> insert into stream_20BBS0122 values(1019, 'Physics Integrated', 22);

1 row created.

SQL> insert into stream_20BBS0122 values(1020, 'Astrophysics', 6);

1 row created.
```

```
SQL> insert into student_20BBS0122 values('20BBS0120', 'Atharva Pradeep', 2020, 100, 1015);

1 row created.

SQL> insert into student_20BBS0122 values('20BBS0122', 'Aryaman Kolhe', 2020, 100, 1015);

1 row created.

SQL> insert into student_20BBS0122 values('17PHY0121', 'Vaibhav Revankar', 2017, 102, 1019);

1 row created.

SQL> insert into student_20BBS0122 values('18CHE0123', 'Hari Ganesan', 2018, 104, 1018);

1 row created.

SQL> insert into student_20BBS0122 values('17CYS0160', 'Hari Pillai', 2017, 100, 1016);

1 row created.

SQL> insert into student_20BBS0122 values('20NAS0219', 'Aryan Santosh', 2020, 103, 1019);

1 row created.

SQL> insert into student_20BBS0122 values('19CSE0134', 'Rahul Dravid', 2019, 100, 1014);

1 row created.
```

Final Tables (Output of Task 1)

```
SQL> select * from school_20BBS0122;

 SCHOOL_ID SCHOOL_NAME                         NUM_FACULTY
---------- ------------------------------- -----------
       100 SCOPE                                     20
       101 SELECT                                    17
       102 Physics                                   12
       103 Nanoscience                                4
       104 Chemical Sciences                         18

SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                         NUM_COURSES
---------- ------------------------------- -----------
      1014 CSE                                       56
      1015 CSE + Business Systems                    32
      1016 CSE + Cybersecurity                       15
      1017 CSE + IoT                                 25
      1018 Chemical Engineering                      34
      1019 Physics Integrated                        22
      1020 Astrophysics                               6

7 rows selected.
```

```
SQL> select * from student_20BBS0122;

STUDENT_ID           NAME                             YEAR_OF_JOINING  SCHOOL_ID
-------------------- ------------------------------   ---------------- ----------
 STREAM_ID
----------
20BBS0120            Atharva Pradeep                             2020        100
      1015

20BBS0122            Aryaman Kolhe                               2020        100
      1015

17PHY0121            Vaibhav Revankar                            2017        102
      1019
```

```
STUDENT_ID           NAME                             YEAR_OF_JOINING  SCHOOL_ID
-------------------- ------------------------------   ---------------- ----------
 STREAM_ID
----------
18CHE0123            Hari Ganesan                                2018        104
      1018

17CYS0160            Hari Pillai                                 2017        100
      1016

20NAS0219            Aryan Santosh                               2020        103
      1019


STUDENT_ID           NAME                             YEAR_OF_JOINING  SCHOOL_ID
-------------------- ------------------------------   ---------------- ----------
 STREAM_ID
----------
19CSE0134            Rahul Dravid                                2019        100
      1014

7 rows selected.
```

Attempting to insert invalid values to test all DB constraints:

School Table and Stream Table –

```
SQL> insert into school_20BBS0122 values(110, 'CS', 3);
insert into school_20BBS0122 values(110, 'CS', 3)
*
ERROR at line 1:
ORA-02290: check constraint (ARYAMAN.STUDENT_SCHOOL_NAME_CHECK) violated


SQL> insert into school_20BBS0122 values(111, 'Nanoscience', 3);
insert into school_20BBS0122 values(111, 'Nanoscience', 3)
*
ERROR at line 1:
ORA-00001: unique constraint (ARYAMAN.STUDENT_SCHOOL_NAME_UNIQUE) violated


SQL> insert into stream_20BBS0122 values(1022, 'CSE', 35);
insert into stream_20BBS0122 values(1022, 'CSE', 35)
*
ERROR at line 1:
ORA-00001: unique constraint (ARYAMAN.SYS_C007084) violated


SQL> insert into stream_20BBS0122 values(1022, '', 35);
insert into stream_20BBS0122 values(1022, '', 35)
                                           *
ERROR at line 1:
ORA-01400: cannot insert NULL into ("ARYAMAN"."STREAM_20BBS0122"."STREAM_NAME")
```

Student Table –

```
SQL> insert into student_20BBS0122 values ('18CHE0123', 'John Smith', 1999, 100, 1014);
insert into student_20BBS0122 values ('18CHE0123', 'John Smith', 1999, 100, 1014)
*
ERROR at line 1:
ORA-00001: unique constraint (ARYAMAN.SYS_C007087) violated


SQL> insert into student_20BBS0122 values ('19CHE0123', 'John Smith', 20211, 100, 1014);
insert into student_20BBS0122 values ('19CHE0123', 'John Smith', 20211, 100, 1014)
*
ERROR at line 1:
ORA-02290: check constraint (ARYAMAN.STUDENT_YEAR_OF_JOIN_CHECK) violated


SQL> insert into student_20BBS0122 values ('19CHE0123', '', 20211, 100, 1014);
insert into student_20BBS0122 values ('19CHE0123', '', 20211, 100, 1014)
                                                   *
ERROR at line 1:
ORA-01400: cannot insert NULL into ("ARYAMAN"."STUDENT_20BBS0122"."NAME")
```

```
SQL> insert into student_20BBS0122 values ('19CHE0123', 'John Smith', 2019, 110, 1014);
insert into student_20BBS0122 values ('19CHE0123', 'John Smith', 2019, 110, 1014)
*
ERROR at line 1:
ORA-02291: integrity constraint (ARYAMAN.SYS_C007088) violated - parent key not
found
```

Task 2:

At least 5 courses should be there for each stream, so change the appropriate table accordingly.

Currently, the table allows less than 5 courses per stream.

```
SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                     NUM_COURSES
---------- ------------------------------ -----------
      1014 CSE                                     56
      1015 CSE + Business Systems                  32
      1016 CSE + Cybersecurity                     15
      1017 CSE + IoT                               25
      1018 Chemical Engineering                    34
      1019 Physics Integrated                      22
      1020 Astrophysics                             6

7 rows selected.

SQL> insert into stream_20BBS0122 values( 1021, 'Particle Physics', 4 );

1 row created.

SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                     NUM_COURSES
---------- ------------------------------ -----------
      1014 CSE                                     56
      1015 CSE + Business Systems                  32
      1016 CSE + Cybersecurity                     15
      1017 CSE + IoT                               25
      1018 Chemical Engineering                    34
      1019 Physics Integrated                      22
      1020 Astrophysics                             6
      1021 Particle Physics                         4

8 rows selected.
```

Can't directly alter table, since violations exist

```
SQL> alter table stream_20BBS0122 add constraint stream_num_courses_chk check (num_courses >= 5);
alter table stream_20BBS0122 add constraint stream_num_courses_chk check (num_courses >= 5)
                                                                          *
ERROR at line 1:
ORA-02293: cannot validate (ARYAMAN.STREAM_NUM_COURSES_CHK) - check constraint
violated
```

Update the table's values, and then add the constraint

```
SQL> update stream_20BBS0122 set num_courses = 5 where num_courses < 5;

1 row updated.

SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                      NUM_COURSES
---------- -------------------------------- -----------
      1014 CSE                                       56
      1015 CSE + Business Systems                    32
      1016 CSE + Cybersecurity                       15
      1017 CSE + IoT                                 25
      1018 Chemical Engineering                      34
      1019 Physics Integrated                        22
      1020 Astrophysics                               6
      1021 Particle Physics                           5

8 rows selected.

SQL> alter table stream_20BBS0122 add constraint stream_num_courses_chk check (num_courses >= 5);

Table altered.
```

Now try inserting an invalid entry (SQL won't allow it)

```
SQL> insert into stream_20BBS0122 values(1022, 'Biotechnology', 4);
insert into stream_20BBS0122 values(1022, 'Biotechnology', 4)
*
ERROR at line 1:
ORA-02290: check constraint (ARYAMAN.STREAM_NUM_COURSES_CHK) violated
```

Task 3:

Rahul (19CSE0134) decided to pursue his passion and changed his stream to Astrophysics from CSE. Update the records accordingly.

Identify who Rahul is.

```
SQL> select * from student_20BBS0122 where name like 'Rahul%';

STUDENT_ID          NAME                            YEAR_OF_JOINING  SCHOOL_ID
-------------------- ------------------------------ ---------------- ----------
 STREAM_ID
----------
19CSE0134           Rahul Dravid                               2019        100
      1014
```

Cross check with the roll number.

Identify the right IDs of the school and stream

```
SQL> select * from school_20BBS0122;

 SCHOOL_ID SCHOOL_NAME                          NUM_FACULTY
---------- ------------------------------ -----------
       100 SCOPE                                    20
       101 SELECT                                   17
       102 Physics                                  12
       103 Nanoscience                               4
       104 Chemical Sciences                        18

SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                          NUM_COURSES
---------- ------------------------------ -----------
      1014 CSE                                      56
      1015 CSE + Business Systems                   32
      1016 CSE + Cybersecurity                      15
      1017 CSE + IoT                                25
      1018 Chemical Engineering                     34
      1019 Physics Integrated                       22
      1020 Astrophysics                              6
      1021 Particle Physics                          5

8 rows selected.
```

Update Rahul's details

```
SQL> update student_20BBS0122
  2  SET student_id = '19PHY0199', school_id = 100, stream_id = 1020
  3  WHERE student_id = '19CSE0134';

1 row updated.

SQL> select * from student_20BBS0122 where name like 'Rahul%';

STUDENT_ID          NAME                             YEAR_OF_JOINING  SCHOOL_ID
------------------- ---------------------------- ---------------- ----------
 STREAM_ID
----------
19PHY0199           Rahul Dravid                                2019        100
      1020
```

Task 4:

Students who joined in 2017 have graduated, so delete their records from the database.

```
SQL> select * from student_20BBS0122 where year_of_joining = 2017;

STUDENT_ID          NAME                             YEAR_OF_JOINING  SCHOOL_ID
------------------- ---------------------------- ---------------- ----------
 STREAM_ID
----------
17PHY0121           Vaibhav Revankar                            2017        102
      1019

17CYS0160           Hari Pillai                                 2017        100
      1016


SQL> delete from student_20BBS0122 where year_of_joining = 2017;

2 rows deleted.

SQL> select * from student_20BBS0122 where year_of_joining = 2017;

no rows selected
```

Task 5:

The Chemical Engineering stream and its students have been shifted to another campus, so delete all related records (using On Delete Cascade).

Before deleting the records:

```
SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                  NUM_COURSES
---------- --------------------------- -----------
      1014 CSE                                  56
      1015 CSE + Business Systems               32
      1016 CSE + Cybersecurity                  15
      1017 CSE + IoT                            25
      1018 Chemical Engineering                 34
      1019 Physics Integrated                   22
      1020 Astrophysics                          6
      1021 Particle Physics                      5

8 rows selected.

SQL> select * from student_20BBS0122 where stream_id = 1018;

STUDENT_ID           NAME                         YEAR_OF_JOINING  SCHOOL_ID
-------------------- --------------------------- ---------------- ----------
 STREAM_ID
----------
18CHE0123            Hari Ganesan                             2018        104
      1018
```

After deleting the records:

```
SQL> delete from stream_20BBS0122 where stream_id = 1018;

1 row deleted.

SQL> select * from stream_20BBS0122;

 STREAM_ID STREAM_NAME                  NUM_COURSES
---------- --------------------------- -----------
      1014 CSE                                  56
      1015 CSE + Business Systems               32
      1016 CSE + Cybersecurity                  15
      1017 CSE + IoT                            25
      1019 Physics Integrated                   22
      1020 Astrophysics                          6
      1021 Particle Physics                      5

7 rows selected.

SQL> select * from student_20BBS0122 where stream_id = 1018;

no rows selected
```

Task 6:

The school of nanoscience has been merged into the physics department. Delete the nanoscience department and update the student records. (change foreign key constraint to account for - On Delete Set Null).

First Locate the constraint which specifies school_id as a foreign key in the student table. Then drop it. Then add the constraint with *on delete set null*.

```
SQL> alter table student_20BBS0122 drop constraint SYS_C007088;

Table altered.

SQL> alter table student_20BBS0122 add constraint foreign key(school_id) references school_20BBS0122(school_id)
  2  ;
alter table student_20BBS0122 add constraint foreign key(school_id) references school_20BBS0122(school_id)
                                                                                                *
ERROR at line 1:
ORA-00902: invalid datatype


SQL> alter table student_20BBS0122
  2      add constraint student_school_id_fr
  3              foreign key(school_id) references school_20BBS0122(school_id)
  4              on delete set null;

Table altered.

SQL> select constraint_name from user_constraints where table_name = 'STUDENT_20BBS0122';

CONSTRAINT_NAME
------------------------------
SYS_C007085
STUDENT_YEAR_OF_JOIN_CHECK
SYS_C007087
STUDENT_SCHOOL_ID_FR
STUDENT_STREAM_ID_FR
```

This is what the school and student tables look like:

```
SQL> select * from school_20BBS0122;

 SCHOOL_ID SCHOOL_NAME                     NUM_FACULTY
---------- ------------------------------- -----------
       100 SCOPE                                    20
       101 SELECT                                   17
       102 Physics                                  12
       103 Nanoscience                               4
       104 Chemical Sciences                        18

SQL> select * from student_20BBS0122;

STUDENT_ID          NAME                           YEAR_OF_JOINING  SCHOOL_ID
------------------- ------------------------------ ---------------- ----------
 STREAM_ID
----------
20BBS0120           Atharva Pradeep                            2020        100
      1015

20BBS0122           Aryaman Kolhe                              2020        100
      1015

20NAS0219           Aryan Santosh                              2020        103
      1019


STUDENT_ID          NAME                           YEAR_OF_JOINING  SCHOOL_ID
------------------- ------------------------------ ---------------- ----------
 STREAM_ID
----------
19PHY0199           Rahul Dravid                               2019        100
      1020
```

Drop the Nanoscience school from the school table. Then every student belonging to that school will have NULL values as school_id.

```
SQL> delete from school_20BBS0122 where school_id = 103;

1 row deleted.

SQL> select * from school_20BBS0122;

 SCHOOL_ID SCHOOL_NAME                       NUM_FACULTY
---------- ------------------------------ -----------
       100 SCOPE                                   20
       101 SELECT                                  17
       102 Physics                                 12
       104 Chemical Sciences                       18

SQL> select * from student_20BBS0122;

STUDENT_ID           NAME                            YEAR_OF_JOINING  SCHOOL_ID
-------------------- ---------------------------- ---------------- ----------
 STREAM_ID
----------
20BBS0120            Atharva Pradeep                           2020        100
      1015

20BBS0122            Aryaman Kolhe                             2020        100
      1015

20NAS0219            Aryan Santosh                            2020
      1019

STUDENT_ID           NAME                            YEAR_OF_JOINING  SCHOOL_ID
-------------------- ---------------------------- ---------------- ----------
 STREAM_ID
----------
19PHY0199            Rahul Dravid                             2019        100
      1020
```

Modify such NULL entries to contain the school_id 102 (Stands for the Physics department)

```
SQL> update student_20BBS0122 set school_id = 102 where school_id is null;

1 row updated.

SQL> select * from student_20BBS0122;

STUDENT_ID          NAME                           YEAR_OF_JOINING SCHOOL_ID
------------------- ------------------------------ --------------- ----------
 STREAM_ID
----------
20BBS0120           Atharva Pradeep                           2020        100
      1015

20BBS0122           Aryaman Kolhe                             2020        100
      1015

20NAS0219           Aryan Santosh                            2020        102
      1019


STUDENT_ID          NAME                           YEAR_OF_JOINING SCHOOL_ID
------------------- ------------------------------ --------------- ----------
 STREAM_ID
----------
19PHY0199           Rahul Dravid                             2019        100
      1020
```

Conclusion

Therefore, all tasks have been completed successfully, and Constraints have been explored in detail in SQL.

Notes:

- Don't use double quotes "" for varchar2! Use single quotes ''
- To delete records from table:
  delete from student_20BBS0122;
- Useful query to view the constraints
  select constraint_name from user_constraints;
- In the query,
  alter table student_20BBS0122 drop constraint SYS_C007088;
  make sure that the constraint name is not in quotes ''
- To access user tables:
  select table_name from user_tables;

Thank you!