DataBases

Lab sheet 2: DBMS administration

OBJECTIVES:

- **Database Creation and Manipulation:** This lab emphasizes the process of creating, managing, and querying a database.
- **Static Integrity Constraints:** Understanding and applying static integrity constraints to ensure data consistency.
- **Schema Evolution:** Exploring schema modifications and adaptations over time to meet evolving data requirements.

The following DB will be used throughout the labs during this semester.

Consider the " School Management System" database, the relational schema of which is given below:

STUDENT (**StudentID**, FirstName, LastName, BirthDate, Address, Email, Year)

COURSE (**CourseID**, CourseName, CourseCoef, CourseCredits)

ENROLLMENT (**StudentID*, CourseID***, EnrollmentDate, FinalMark)

TEACHER (**TeacherID**, CIV, FirstName, LastName, Salary, Email, Grade)

COURSE_ASSIGNMENT (**CourseID*, TeacherID***, StartDate, EndDate)

EXAM (**ExamID**, CourseID*, ExamDate, ExamType)

EXAM_RESULT (**ResultID**, StudentID*, ExamID*, Score)

In this schema:

- Attributes ending with **Date** are of type Date; **CourseCredits** and those ending with **ID** are integers, and all others are strings, except for **Salary**, **FinalMark** and **Score** which are reals
- The **Grade** of a teacher is a string taken from the domain {'Assistant', 'Associate', 'Full Professor'}.
- The **CIV** attribute is a character string taken from the domain {'Mr', 'Miss', 'Mrs'}.
- **ExamType** could be Midterm, Final, or Quiz.

Student table:

StudentID	FirstName	LastName	BirthDate	Address	Email	Year
1	Cherifa	Haddad	22/10/2005	city 1024 Logts, Djenane Sfari, Alger	cherifa.haddad@ensia.edu.dz	1
2	Amina	Larbi	13/12/2006	city 2000 Logts, Ain Naadja, Alger	amina.larbi@ensia.edu.dz	1
3	Hayat	Ouali	04/11/2005	city 3000 Logts, Bach Djerrah, Alger	hayat.ouali@ensia.edu.dz	1
4	Leila	Ait Aoudia	11/04/2004	city 1000 Logts, Belle Vue, Alger	leila.aitaoudia@ensia.edu.dz	2
5	Farah	Zidani	12/06/2004	city 100 Logts, Jolie Vue, Alger	farah.zidani@ensia.edu.dz	2
6	Nesrine	Oukali	28/07/2004	city 200 Logts, Rue Hassiba, Alger	nesrine.oukali@ensia.edu.dz	2
7	Lamisse	Chaabane	15/03/2003	city 301 Logts, Belle Court, Alger	lamisse.chaabane@ensia.edu.dz	3
8	Sabrina	Ben Aissi	23/03/2004	city 2030 Logts, Ben Aknoun, Alger	sabrina.benaissi@ensia.edu.dz	2
9	Zahra	Saoudi	17/02/2006	city 190 Logts, Bir Khadem, Alger	zahra.saoudi@ensia.edu.dz	1
10	Wardia	Khaldi	06/05/2003	city 1024 Logts, Sidi Abdellah, Alger	wardia.khaldi@ensia.edu.dz	3
11	Narjis	Merabet	05/11/2003	city 2000 Logts, El Harrache, Alger	narjis.merabet@ensia.edu.dz	3
12	Douaa	Jdid	11/09/2004	city 3000 Logts, Hay El Badr, Alger	douaa.jdid@ensia.edu.dz	2
13	Dina	Mendes	09/08/2004	city 1000 Logts, Mer et Soleil, Alger	dina.mendes@ensia.edu.dz	2
14	Khawla	Ben Ali	14/06/2006	city 100 Logts, Les Fusiliers, Alger	khawla.benali@ensia.edu.dz	1
15	Ibtissam	Bouklioua	17/05/2004	city 200 Logts, Aisset Idir, Alger	ibtissam.bouklioua@ensia.edu.dz	2
16	Sajida	Derbane	26/12/2003	city 1024 Logts, Djenane Sfari, Alger	sajida.derbane@ensia.edu.dz	3
17	Abdelfattah	Ait Mokhtar	29/01/2005	city 2000 Logts, Ain Naadja, Alger	abdelfattah.aitmokhtar@ensia.edu.dz	1
18	Tahar	Amrane	19/04/2004	city 3000 Logts, Bach Djerrah, Alger	tahar.amrane@ensia.edu.dz	2
19	Ali	Ben Chikh	01/01/2004	city 1000 Logts, Belle Vue, Alger	ali.benchikh@ensia.edu.dz	2
20	Hicham	Bennour	08/10/2006	city 100 Logts, Jolie Vue, Alger	hicham.bennour@ensia.edu.dz	1
21	Mustafa	Ben Yattou	04/01/2003	city 190 Logts, Bir Khadem, Alger	mustafa.benyattou@ensia.edu.dz	3
22	Adem	Laichi	29/12/2004	city 1024 Logts, Sidi Abdellah, Alger	adem.laichi@ensia.edu.dz	2
23	Mohamed	Kadourri	01/01/2005	city 2000 Logts, El Harrache, Alger	mohamed.kadourri@ensia.edu.dz	1
24	Aymen	Kadri	12/13/2022	city 190 Logts, Bir Khadem, Alger	Aymen.kadri@ensia.edu.dz	2

Course Table:

CourseID	CourseName	CourseCoef	CourseCredits
1	Introduction to AI	4	6
2	Data Structures and Algorithms 1	3	6
3	Data Structures and Algorithms 2	4	5
4	Databases	3	5
5	Digital systems	3	4
6	ITE	2	4
7	Computer and network security	3	5
8	Probability	2	4
9	Web Development	2	6
10	Machine learning	4	6
11	Maths 1	3	6
12	Operating Systems	3	5
13	Data mining	4	5
14	Electronic Circuits	1	2
15	Object oriented programming	4	6

TEACHER Table:

TeacherID	CIV	FirstName	LastName	Salary	Email	Grade
1	Mrs	Sajida	Laichi	256000	Sajida.laichi@ensia.edu.dz	Full Professor
2	Miss	Nesrine	Kadouri	140000	Nessrine.kadouri@ensia.edu.dz	Associate
3	Mr	Adem	Ghezlane	84000	Adem.ghezlane@ensia.edu.dz	Assistant
4	Mrs	Douaa	Bennour	149000	Douaa.bennour@ensia.edu.dz	Associate
5	Mr	Mohamed	Ben Ali	250000	Mohamed.benali@ensia.edu.dz	Full Professor
6	Mr	Hakim	Boutaleb	157000	Hakim.boutaleb@ensia.edu.dz	Associate
7	Miss	Anfal	Amrane	131000	Anfal.amrane@enisa.edu.dz	Associate
8	Mr	Hicham	Barkat		Hicham.barkat@ensia.edu.dz	Associate

ENROLLMENT Table:

StudentID	CourseID	EnrollmentDate	FinalMark
1	2	25/09/2023	
2	2	26/09/2023	
3	11	25/09/2023	
9	5	28/09/2023	
14	11	29/09/2023	
17	6	25/09/2023	
20	15	29/01/2024	
23	2	24/09/2023	
1	11	27/09/2023	
2	11	26/09/2023	
3	5	26/09/2023	
9	11	25/09/2023	
14	6	26/09/2023	
17	15	28/01/2024	
20	2	24/09/2023	
23	11	24/09/2023	
1	15	28/01/2024	
2	15	25/09/2023	
3	6	24/09/2023	
5	12	29/01/2024	
4	1	30/01/2024	
6	3	27/09/2023	
12	14	29/01/2024	
8	4	28/09/2023	
13	8	26/09/2023	
15	9	24/09/2023	
19	12	29/01/2024	
5	1	04/02/2024	
4	3	27/09/2023	
6	14	28/01/2024	
12	4	27/09/2023	
13	12	29/01/2024	
15	8	29/09/2023	
19	1	30/01/2024	
7	7	29/01/2024	
11	13	26/09/2023	
10	10	29/01/2024	
16	7	02/02/2024	
21	13	28/09/2023	
7	10	29/01/2024	
21	7	29/01/2024	
7	13	26/09/2023	
11	10	29/01/2024	
10	7	29/01/2024	
16	13	28/09/2023	
2	16	28/09/2023	
35	13	29/01/2024	

EXAM Table:

ExamID	CourseID	ExamDate	ExamType
1	1	25/03/2024	Quiz
2	1	27/03/2024	Midterm
3	1	26/04/2024	Final
4	2	14/10/2023	Quiz
5	2	15/11/2023	Midterm
6	2	16/01/2024	Final
7	3	14/10/2023	Quiz
8	3	13/11/2023	Midterm
9	3	16/01/2024	Final
10	4	14/11/2023	Midterm
11	4	15/01/2024	Final
12	5	14/12/2023	Quiz
13	5	17/11/2023	Midterm
14	5	17/01/2024	Final
15	6	12/10/2023	Midterm
16	6	12/01/2024	Final
17	7	22/03/2024	Midterm
18	7	27/04/2024	Final
19	8	22/11/2023	Midterm
20	8	17/01/2024	Final
21	9	19/11/2023	Midterm
22	9	18/01/2024	Final
23	10	25/02/2024	Quiz
24	10	28/03/2024	Midterm
25	10	29/04/2024	Final
26	11	13/11/2023	Midterm
27	11	18/01/2024	Final
28	12	26/02/2024	Quiz
29	12	23/03/2024	Midterm
30	12	22/04/2024	Final
31	13	10/10/2023	Midterm
32	13	12/11/2023	Final
33	14	01/05/2024	Final
34	15	21/03/2024	Midterm
35	15	01/05/2024	Final

COURSE_ASSIGNMENT Table:

CourseID	TeacherID	StartDate	EndDate
1	1	30/01/2024	02/02/2024
2	3	24/09/2023	14/01/2024
3	4	25/09/2023	14/01/2024
4	2	25/09/2023	14/01/2024
5	4	26/09/2023	14/01/2024
6	7	24/09/2023	14/01/2024
7	7	29/01/2024	23/05/2024
8	5	26/09/2023	14/01/2024
9	3	24/09/2023	14/01/2024
10	4	29/01/2024	23/05/2024
11	2	25/09/2023	14/01/2024
12	6	29/01/2024	23/05/2024
13	1	25/09/2023	14/01/2024
14	6	28/01/2024	01/02/2024
15	2	28/01/2024	23/05/2024
1	23	28/01/2024	24/06/2024
19	2	24/09/2023	14/01/2024

EXAM_RESULT Table:

ResultID	StudentID	ExamID	Score
1	1	1	14
2	1	2	13.5
3	1	3	15
4	1	26	18
5	1	27	14
6	1	34	16
7	1	35	14
8	2	1	13.5
9	2	2	15
10	2	3	15
11	2	26	18
12	2	27	10
13	2	34	15
14	2	35	18
15	3	26	14
16	3	27	14
17	3	12	13.5
18	3	13	15
19	3	14	9
20	3	15	12.5
21	3	16	10.25
22	4	1	11
23	4	2	8
24	4	3	12.5
25	4	7	13
26	4	8	10
27	4	9	14
28	5	1	15
29	5	2	18
30	5	3	14
31	5	28	12
32	5	29	13
33	5	30	15
34	6	7	13.5
35	6	8	15
36	6	33	9
37	7	17	12.5
38	7	18	10.25
39	7	23	13
40	7	24	10
41	7	25	14
42	7	31	13.5
43	7	32	15
44	8	10	9
45	8	11	12.5
46	9	12	10.25
47	9	13	13.5
48	9	14	15
49	9	26	9
50	9	27	12.5
51	10	23	10.25
52	10	24	14
53	10	25	15
54	10	17	13.5
55	10	18	15
56	11	31	9
57	11	32	12.5
58	11	23	10.25
59	11	24	13
60	11	25	10
61	12	33	14
62	12	10	15
63	12	11	13.5
64	13	19	15
65	13	20	9
66	13	28	12.5
67	13	29	10.25
68	13	30	0
69	14	26	13
70	14	27	10
71	14	15	14
72	14	16	15
73	15	19	13.5
74	15	20	15
75	15	21	9
76	15	22	12.5
77	16	17	10.25
78	16	18	14
79	17	15	15
80	17	16	13.5
81	17	34	15
82	17	35	9
83	19	28	12.5
84	19	29	10.25
85	19	1	14
86	19	2	15
87	19	3	13.5
88	20	34	15
89	20	35	9
90	20	4	12.5
91	20	5	10.25
92	20	6	14
93	21	31	15
94	21	32	10
95	21	17	14
96	21	18	15
97	23	4	13.5
98	23	5	15
99	23	6	9
100	23	26	12.5
101	23	27	10.25
102	2	40	12
103	34	26	11

It is advisable to create a user as well as the necessary objects to obtain more flexibility in the administration.

Creating a user requires at least two tablespaces, one default and one temporary. These operations must be performed as a DBA (Data Base Administrator).

Some Syntaxes:

- **Tablespace creation**

CREATE TABLESPACE xxx_tbs DATAFILE 'C:\tbs_xxx.dat' SIZE 100M AUTOEXTEND ON ONLINE;

Description :

CREATE TABLESPACE xxx_tbs	Specifies the name of the database tablespace.
DATAFILE 'C:\tbs_xxx.dat' SIZE 100M	Specifies the full name of the system file and its size in megabytes.
AUTOEXTEND ON	The size is increased automatically in case of saturation
ONLINE	Available immediately upon creation

- **Temporary Tablespace creation**

CREATE TEMPORARY TABLESPACE xxx_TempTBS TEMPFILE 'C:\temp_xxx.dat' SIZE 100M AUTOEXTEND ON;

- **User creation**

Create User User_Name Identified by Password Default Tablespace Tablespace_Name Temporary Tablespace Temp_Tablespace_Name;

- **Grant all rights to the user:**

GRANT ALL privileges to User_Name

- **Table creation**

CREATE TABLE [schema.] Table_name (column1 type1 [DEFAULT value1] [NOT NULL] [, column2 type2 [DEFAULT value2] [NOT NULL]] [CONSTRAINT constraintName1 constraintType1]);

Four types of constraints

- UNIQUE (column1[,column2])
- PRIMARY KEY (column1[,column2])
- FOREIGN KEY (column1 [,column2]) REFERENCES [schma.]parentTableName (column1 [,column2]) [ON DELETE { CASCADE | SET NULL }]
- CHECK (condition)

To modify data without taking into account a constraint, this constraint must be deactivated:

ALTER TABLE tableName DISABLE CONSTRAINT constraintName;

To Activate a Constraint

ALTER TABLE tableName ENABLE CONSTRAINT constraintName [EXCEPTIONS INTO tableErrors];

Create the "tableErrors" table to identify the tuples that do not satisfy the constraint.

CREATE TABLE TableErrors (address ROWID, user VARCHAR2(30), tableName VARCHAR2(30), constraintName VARCHAR2(30));

Required work

Week 1-LAB 2: Tables and Constraints Creation

Part I: Creating TableSpaces and Users

1. Create two TableSpaces **School_TBS** and **School_TempTBS**
2. Create a **DBASchool** user by assigning him the two tablespaces created previously
3. Grant all privileges to this user.

Part II: Data Definition Language

4. Create the basic relationships.
5. Add all constraints
6. List the problems you encountered
7. How did you correct them

Week 2-LAB 2: Updating the Structure

8. Add the **HireDate** attribute of Date type to the Teacher relationship.
9. Add the not null constraint for the **Grade**, **Salary** attributes of the Teacher relationship.
10. Modify the length of the **FirstName** attribute of the Teacher relationship (enlarge, reduce).
11. Delete the **HireDate** column in the Teacher table. Verify deletion.
12. Rename the **Address** column in the **Student** table to **StudentAddress**. Check.
13. Add the following constraint: The course **start date** must be less than its **end date**.

Week 2-LAB 2: Data manipulation language

14. Fill all the tables by the instances represented above
15. List the problems you encountered
16. How did you correct them
17. Suppose the salary of **Pr.Sajida Laichi** increased by 5000DA. What should be done?
18. For **Courses** in the month of **January**, add 5 five days to the start date. Disable constraint to allow editing. Reactivate the constraint.
19. Delete all '**Object oriented programming**' course. What are the problems encountered?
20. How did you correct them