Project 2

Encrypted COMPANY

Due at the beginning of the class, Wednesday, November 10, 2021

Submitted to Blackboard by the beginning of the class

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In Project 1, we created a MySQL database which contains employee table (shown in Figure 1) and department table.

mysql> select * from employee;

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren,Houston, TX	M	30000.00	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss,Houston, TX	M	40000.00	888665555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice,Houston, TX	F	25000.00	333445555	5
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak,Houston, TX	M	38000.00	333445555	5
James	E	Borg	888665555	1937-11-10	450 Stone,Houston, TX	M	55000.00	NULL	1
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry,Bellaire, TX	F	43000.00	888665555	4
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas,Houston, TX	M	25000.00	987654321	4
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle,Spring, TX	F	25000.00	987654321	4

Figure 1: Employee Table

In this project, we are going to encrypt the Salary column using Caesar Cryptography (symmetric key is 3) [1]. However, as the Salary column is encrypted then the ordering of original salaries is lost. Therefore, a new column Salary_inx is created to preserve the ordering of original salaries. The values of Salary_inx are generated using the AVL algorithm [2]. In this project, your task is to encrypt the values of original salaries using Caesar into Encypted_salary column. After inserting Caesar vales into Encrypted_salary, the encrypted employee table show be looked like the one in Figure 2.

output text format: Hex

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	**Salary**	Super_ssn	Dno	Encrypted_Salary	Salary_Inx
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	**30000.00**	333445555	5		4
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	**40000.00**	888665555	5		8
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	**25000.00**	333445555	5		2
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Houston, TX	M	**38000.00**	333445555	5		6
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	**55000.00**	NULL	1		14
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000.00	888665555	4		12
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000.00	987654321	4		2
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000.00	987654321	4		2

Figure 2: Encrypted Employee Table

The following SQL statements are used to help answer the following questions.

mysql> Use Company;
mysql> Show Database;
mysql> show tables;

mysql> show tables;

```
+------------------+
| Tables_in_company |
+------------------+
| department        |
| employee          |
+------------------+
2 rows in set (0.01 sec)
```

mysql> Alter Table EMPLOYEE add Encrypted_salary VARCHAR(50), Salary_inx INT;

mysql> alter table employee alter Fname set default ‘’;
mysql> alter table employee alter Lname set default ‘’;
mysql> alter table employee alter dno set default 0;
Query OK, 0 rows affected (0.01 sec)

Records: 0 Duplicates: 0 Warnings: 0

```
mysql> describe employee;
+-----------------+--------------+------+-----+---------+-------+
| Field           | Type         | Null | Key | Default | Extra |
+-----------------+--------------+------+-----+---------+-------+
| Fname           | varchar(15)  | NO   |     |         |       |
| Minit           | char(1)      | YES  |     | NULL    |       |
| Lname           | varchar(15)  | NO   |     |         |       |
| Ssn             | char(9)      | NO   | PRI |         |       |
| Bdate           | date         | YES  |     | NULL    |       |
| Address         | varchar(30)  | YES  |     | NULL    |       |
| Sex             | char(1)      | YES  |     | NULL    |       |
| Salary          | decimal(10,2)| YES  |     | NULL    |       |
| Super_ssn       | char(9)      | YES  |     | NULL    |       |
| Dno             | int          | NO   |     | 0       |       |
| Encrypted_salary| varchar(50)  | YES  |     | NULL    |       |
| Salary_inx      | int          | YES  |     | NULL    |       |
+-----------------+--------------+------+-----+---------+-------+
```
12 rows in set (0.00 sec)

You should now be able to encrypt each individual salary using the Caesar cipher and use the SQL update statement to add the encrypted values into Encrypted_salary. A sample is shown below with the value of Encrypted_salary blank.

mysql> update employee set encrypted_salary = 'TO BE FILLED IN', where minit='T';
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0

Continue to update the Encrypted_salary for the rest of employees.

You are now ready to answer the following questions against the encrypted database COMPANY.

Questions

1. (25 Points) Select Ssn, Salary from employee where salary >= 38000;
2. (25 Points) Select Encrypted_Salary from employee where salary_inx >= 6; and decrypt Encrypted_salary using Caesar;
3. (25 Points) Select salary from employee where Fname = 'John';
4. (25 Points) Select encrypted_salary from employee where Fname = 'John' and decrypt the encrypted_salary using Caesar?

References

[1] Cryptii, Caesar cipher: Encode and decode online, Retrieved from *https://cryptii.com/pipes/caesar-cipher*

[2] AVL, *https://www.cs.usfca.edu/~galles/visualization/AVLtree.html*
Note that: max value 9999 allowed