

3. Write the following as triggers on the EMPLOYEE Schema which you have already created. In each case, disallow if it does not satisfy the stated constraint. You may assume that the desired condition holds before any change to the database is attempted. Also, prefer to modify the database, even if it means inserting tuples with NULL or default values, rather than rejecting the attempted modification.

a. Assure that deleting details of an employee deletes his dependent records also.

```
mysql> create trigger Delete_dependent
-> before delete on Employee
-> for each row
-> begin
-> delete from Dependent where OLD.Ssn=Essn;
-> end/
```

Query OK, 0 rows affected (0.01 sec)

```
mysql> delimiter ;
mysql> delete from Employee where Ssn='653298699';
Query OK, 1 row affected (0.01 sec)
```

b. Whenever a department with exactly one project is shifted to a new location, ensure that the project is also shifted to the new location.

```
mysql> delimiter /
mysql> create procedure location(Dlocation varchar(15),Dnumber int)
-> begin
-> update Project set Plocation=Dlocation where Dnum=Dnumber;
-> end/
Query OK, 0 rows affected (0.01 sec)
mysql> create trigger location_change
-> before update on Dept_locations
-> for each row
-> if NEW.Dnumber in (select Dnum from (dept_locations join Project on Dnum=Dnumber)
group by Dnum having count(*)=1)
-> then call location(NEW.Dlocation,NEW.Dnumber);
-> end if;
-> end/
```

Query OK, 0 rows affected (0.02 sec)

```
mysql> update Dept_locations set Dlocation='Hosur' where Dnumber=4;
```

Query OK, 1 row affected (0.01 sec)

Rows matched: 1 Changed: 1 Warnings: 0

c. Assure at all times that there are no departments with more than 3 projects.

mysql> create trigger project_limit

-> before insert on Project

-> for each row

-> begin

-> if NEW.Dnum in (select dnum from (department join Project on Dnumber=NEW.Dnum)

group by Dnum having count(*)=3)

-> then set NEW.Dnum=0;

-> end if;

-> end/

Query OK, 0 rows affected (0.02 sec)

mysql> insert into Department values('Unassigned',0,'653298660','1980-09-7');

Query OK, 1 row affected (0.01 sec)

mysql> insert into Project values('ProjectU',12,'Raipur',3);

Query OK, 1 row affected (0.01 sec)

mysql> select * from Project;

Pname	Pnumber	Plocation	Dnum
ProjectX	1	Bellaire	1
ProjectY	2	Sugarland	2
ProjectZ	3	Houston	3
ProjectA	4	Hosur	4
ProjectB	5	Houston	5
ProjectG	6	India	5
ProjectP	7	Madurai	1
ProjectQ	8	Madurai	2
Project10	9	Hydrabad	10
ProjectT	10	Ranchi	3
ProjectW	11	Ranchi	3
ProjectU	12	Raipur	0

12 rows in set (0.00 sec)

d. Assure that no employees work for more than one department.

mysql> create trigger employee_limit

-> before insert on Works_on

-> for each row

-> begin

-> if(select count(*) from Project join Works_on on Pnumber=Pno where Pnumber=NEW.Pno

group by Essn)>1

```
-> then set NEW.Pno=0;
-> end if;
-> end/
```

Query OK, 0 rows affected (0.03 sec)

```
mysql> insert into Project value('Project0',0,'Nowhere',1);
Query OK, 1 row affected (0.01 sec)
```

```
mysql> insert into Works_on values('653298663',0,0);
Query OK, 1 row affected (0.01 sec)
```

```
mysql> select * from Works_on;
```

Essn	Pno	Hours
653298653	1	1.0
653298653	2	2.0
653298653	3	3.0
653298653	4	4.0
653298653	5	5.0
653298653	6	6.0
653298654	2	2.0
653298654	6	4.0
653298655	3	3.0
653298655	7	4.0
653298655	9	4.0
653298656	4	4.0
653298657	5	5.0
653298663	0	0.0
653298663	1	11.0
653298665	1	5.0

16 rows in set (0.00 sec)

e. Whenever a project is dropped, dissociate all the employees from the particular project.

```
mysql> create trigger drop_project
-> after delete on Project
-> for each row
-> begin
-> delete from Works_on where Pno=OLD.Pnumber;
-> end/
```

Query OK, 0 rows affected (0.01 sec)

```
mysql> alter table Works_on drop constraint works_on_ibfk_2;
Query OK, 0 rows affected (0.05 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> delete from Project where Pnumber=2;
Query OK, 1 row affected (0.01 sec)
```

```
mysql> select * from Project;
```

```
+-----+-----+-----+-----+
| Pname   | Pnumber | Plocation | Dnum |
+-----+-----+-----+-----+
| Project0 | 0 | Nowhere | 1 |
| ProjectX | 1 | Bellaire | 1 |
| ProjectZ | 3 | Houston | 3 |
| ProjectA | 4 | Hosur | 4 |
| ProjectB | 5 | Houston | 5 |
| ProjectG | 6 | India | 5 |
| ProjectP | 7 | Madurai | 1 |
| ProjectQ | 8 | Madurai | 2 |
| Project10 | 9 | Hyderabad | 10 |
| ProjectT | 10 | Ranchi | 3 |
| ProjectW | 11 | Ranchi | 3 |
| ProjectU | 12 | Raipur | 0 |
+-----+-----+-----+-----+
12 rows in set (0.00 sec)
```

```
mysql> select * from Works_on;
```

```
+-----+-----+-----+
| Essn    | Pno | Hours |
+-----+-----+-----+
| 653298653 | 1 | 1.0 |
| 653298653 | 3 | 3.0 |
| 653298653 | 4 | 4.0 |
| 653298653 | 5 | 5.0 |
| 653298653 | 6 | 6.0 |
| 653298654 | 6 | 4.0 |
| 653298655 | 3 | 3.0 |
| 653298655 | 7 | 4.0 |
| 653298655 | 9 | 4.0 |
| 653298656 | 4 | 4.0 |
| 653298657 | 5 | 5.0 |
| 653298663 | 0 | 0.0 |
| 653298663 | 1 | 11.0 |
| 653298665 | 1 | 5.0 |
```

```
+-----+-----+
14 rows in set (0.00 sec)
```

```
mysql> alter table Works_on add constraint fk_const_1 foreign key(Pno) refer
ences Project(Pnumber);
Query OK, 14 rows affected (0.14 sec)
Records: 14 Duplicates: 0 Warnings: 0
```

f. When a new department is inaugurated, ensure that it is not co-located with any other departments.

```
mysql> create trigger unique_location
-> before insert on Dept_locations
-> for each row
-> begin
-> if(NEW.Dlocation in(select Dlocation from Dept_locations))
-> then set NEW.Dlocation='nil';
-> end if;
-> end/
Query OK, 0 rows affected (0.01 sec)
```

```
mysql> insert into Dept_locations values(6,'Houston');
Query OK, 1 row affected (0.01 sec)
```

```
mysql> select * from Dept_locations;
+-----+-----+
| Dnumber | Dlocation |
+-----+-----+
| 1 | Houston |
| 2 | Stafford |
| 3 | Bellaire |
| 4 | Hosur |
| 5 | Houston |
| 6 | nil |
+-----+-----+
6 rows in set (0.00 sec)
```

g. For every employee, ensure that his dependent Birthdate is less than his Birthdate.

```
mysql> create trigger bdate_limit
-> before insert on Dependent
-> for each row
-> begin
-> if(NEW.Bdate>(select Bdate from Employee where Employee.Ssn=NEW.Essn))
-> then set NEW.Bdate=NULL;
->
```

-> end if;

-> end/

Query OK, 0 rows affected (0.02 sec)

mysql> insert into Dependent value('65329869','Rajesh','M','1986-05-9','Son');

Query OK, 1 row affected (0.01 sec)

mysql> select * from Dependent;

Essn	Dependent_name	Sex	Bdate	Relationship
653298653	Alice	F	1986-04-05	Daughter
653298654	Joy	F	1986-04-17	Daughter
653298655	Rosy	F	1979-12-17	Spouse
653298656	Rich	M	1979-12-17	Spouse
653298657	Wilson	M	1987-12-17	son
65329869	Rajesh	M	NULL	Son

6 rows in set (0.00 sec)

h. Increment 1000 rupees to the salary for those employees if any of his/her dependent expire

mysql> select * from EMPLOYEE;

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
Hiran	L	Farook	653298100	1962-12-30	21 Oak Forest,Katy,TX	M	90000.00		
			65329869	9					
Alam XYZ	K	Marini	653298653	1962-12-30	98 Oak Forest,Katy,TX	F	37000.00		
			653298663	4					
Allen	C	Mar	653298654	1962-12-30	99 Oak Forest,Katy,TX	M	37000.00		
			653298655	4					
Richson	K	Mario	653298655	1962-12-30	100 Oak Forest,Katy,TX	M	39000.00		
			653298653	4					
Rich	G	Mario	653298656	1962-12-30	101 Oak Forest,Katy,TX	M	39000.00		
			653298653	4					
Richton	G	Mario	653298657	1962-12-30	102 Oak Forest,Katy,TX	F	39000.00		
			653298653	4					
Teju	G	Chouhan	653298660	1962-12-30	111 Oak Forest,Katy,TX	M	39000.00		
			653298653	3					
Tejas	G	Khana	653298661	1962-12-30	112 Oak Forest,Katy,TX	M	41000.00		
			653298660	2					

```

| Kiran   | P   | Yadav | 653298662 | 1962-12-30 | 114 Oak Forest,Katy,TX | M   | 30000.00 |
653298661 | 1 |
| Mukesh  | H   | Ragav | 653298663 | 1962-12-30 | 115 Oak Forest,Katy,TX | F   | 70000.00 |
653298653 | 5 |
| Andrea  | G   | Khan  | 653298665 | 1962-12-30 | 192 Oak Forest,Katy,TX | F   | 60000.00 |
653298660 | 5 |
| Ramsay  | K   | Marini | 65329869  | 1962-12-30 | 98 Oak Forest,Katy,TX  | M   | 37000.00 |
653298653 | 4 |
| Rocky   | H   | Stone | 653298698 | 1962-12-30 | 201 Oak Forest,Katy,TX | M   | 51000.00 |
653298654 | 9 |

```

```

+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

13 rows in set (0.00 sec)

```
mysql> delimiter /
```

```
mysql> create trigger dependent_expire
```

```
-> after delete on Dependent
```

```
-> for each row
```

```
-> begin
```

```
-> update Employee set Salary=Salary+1000 where Ssn=OLD.Essn;
```

```
-> end/
```

Query OK, 0 rows affected (0.02 sec)

```
mysql> delimiter ;
```

```
mysql> delete from Dependent where Essn='65329869';
```

Query OK, 1 row affected (0.01 sec)

```
mysql> select * from Employee;
```

```

+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Fname   | Minit | Lname  | Ssn      | Bdate    | Address                | Sex | Salary | Super_ssn |
| Dno |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Hiran   | L     | Farook | 653298100 | 1962-12-30 | 21 Oak Forest,Katy,TX | M   | 90000.00 |
65329869 | 9 |
| Alam XYZ | K     | Marini | 653298653 | 1962-12-30 | 98 Oak Forest,Katy,TX | F   | 37000.00 |
653298663 | 4 |
| Allen   | C     | Mar    | 653298654 | 1962-12-30 | 99 Oak Forest,Katy,TX | M   | 37000.00 |
653298655 | 4 |
| Richson | K     | Mario  | 653298655 | 1962-12-30 | 100 Oak Forest,Katy,TX | M   | 39000.00 |
653298653 | 4 |
| Rich    | G     | Mario  | 653298656 | 1962-12-30 | 101 Oak Forest,Katy,TX | M   | 39000.00 |
653298653 | 4 |
| Richton | G     | Mario  | 653298657 | 1962-12-30 | 102 Oak Forest,Katy,TX | F   | 39000.00 |
653298653 | 4 |
| Teju    | G     | Chouhan | 653298660 | 1962-12-30 | 111 Oak Forest,Katy,TX | M   | 39000.00 |
653298653 | 3 |

```

Tejas	G	Khana	653298661	1962-12-30	112 Oak Forest,Katy,TX	M	41000.00	653298660	2
Kiran	P	Yadav	653298662	1962-12-30	114 Oak Forest,Katy,TX	M	30000.00	653298661	1
Mukesh	H	Ragav	653298663	1962-12-30	115 Oak Forest,Katy,TX	F	70000.00	653298653	5
Andrea	G	Khan	653298665	1962-12-30	192 Oak Forest,Katy,TX	F	60000.00	653298660	5
Ramsay	K	Marini	65329869	1962-12-30	98 Oak Forest,Katy,TX	M	38000.00	653298653	4
Rocky	H	Stone	653298698	1962-12-30	201 Oak Forest,Katy,TX	M	51000.00	653298654	9

+-----+-----+-----+-----+-----+-----+-----+-----+-----+
13 rows in set (0.00 sec)

*In many questions only insert has been taken into consideration but update can also be done similarly.

Final schema after all these operations:

```
mysql> select * from Employee;
```

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
Hiran	L	Farook	653298100	1962-12-30	21 Oak Forest,Katy,TX	M	90000.00	65329869	9
Alam XYZ	K	Marini	653298653	1962-12-30	98 Oak Forest,Katy,TX	F	37000.00	653298663	4
Allen	C	Mar	653298654	1962-12-30	99 Oak Forest,Katy,TX	M	37000.00	653298655	4
Richson	K	Mario	653298655	1962-12-30	100 Oak Forest,Katy,TX	M	39000.00	653298653	4
Rich	G	Mario	653298656	1962-12-30	101 Oak Forest,Katy,TX	M	39000.00	653298653	4
Richton	G	Mario	653298657	1962-12-30	102 Oak Forest,Katy,TX	F	39000.00	653298653	4
Teju	G	Chouhan	653298660	1962-12-30	111 Oak Forest,Katy,TX	M	39000.00	653298653	3
Tejas	G	Khana	653298661	1962-12-30	112 Oak Forest,Katy,TX	M	41000.00	653298660	2
Kiran	P	Yadav	653298662	1962-12-30	114 Oak Forest,Katy,TX	M	30000.00	653298661	1

Mukesh	H	Ragav	653298663	1962-12-30	115 Oak Forest,Katy,TX	F	70000.00
653298653	5						
Andrea	G	Khan	653298665	1962-12-30	192 Oak Forest,Katy,TX	F	60000.00
653298660	5						
Ramsay	K	Marini	65329869	1962-12-30	98 Oak Forest,Katy,TX	M	38000.00
653298653	4						
Rocky	H	Stone	653298698	1962-12-30	201 Oak Forest,Katy,TX	M	51000.00
653298654	9						

13 rows in set (0.00 sec)

```
mysql> select * from Department;
```

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Unassigned	0	653298660	1980-09-07
Research	1	653298653	1988-05-22
Administration	2	653298654	1988-05-22
Headquarters	3	653298655	1988-05-22
IT	4	653298656	1988-05-22
Clinic	5	653298657	1988-05-22
Accounts	6	65329869	1988-06-22
CS	9	653298662	1988-06-22
Emergency	10	653298660	1988-07-23

9 rows in set (0.00 sec)

```
mysql> select * from Dept_locations;
```

Dnumber	Dlocation
1	Houston
2	Stafford
3	Bellaire
4	Hosur
5	Houston
6	nil

6 rows in set (0.00 sec)

```
mysql> select * from Project;
```

Pname	Pnumber	Plocation	Dnum
-------	---------	-----------	------

Project0	0	Nowhere	1	
ProjectX	1	Bellaire	1	
ProjectZ	3	Houston	3	
ProjectA	4	Hosur	4	
ProjectB	5	Houston	5	
ProjectG	6	India	5	
ProjectP	7	Madurai	1	
ProjectQ	8	Madurai	2	
Project10	9	Hyderabad	10	
ProjectT	10	Ranchi	3	
ProjectW	11	Ranchi	3	
ProjectU	12	Raipur	0	

+-----+-----+-----+-----+

12 rows in set (0.00 sec)

mysql> select * from Dependent;

Essn	Dependent_name	Sex	Bdate	Relationship	
653298653	Alice	F	1986-04-05	Daughter	
653298654	Joy	F	1986-04-17	Daughter	
653298655	Rosy	F	1979-12-17	Spouse	
653298656	Rich	M	1979-12-17	Spouse	
653298657	Wilson	M	1987-12-17	son	

+-----+-----+-----+-----+

5 rows in set (0.00 sec)

mysql> select * from Works_on;

Essn	Pno	Hours	
653298653	1	1.0	
653298653	3	3.0	
653298653	4	4.0	
653298653	5	5.0	
653298653	6	6.0	
653298654	6	4.0	
653298655	3	3.0	
653298655	7	4.0	
653298655	9	4.0	
653298656	4	4.0	
653298657	5	5.0	
653298663	0	0.0	
653298663	1	11.0	

653298665	1	5.0
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+-----+	+-----+	+-----+
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14 rows in set (0.00 sec)