אוניברסיטת חיפה
University of Haifa
جامعة حيفا

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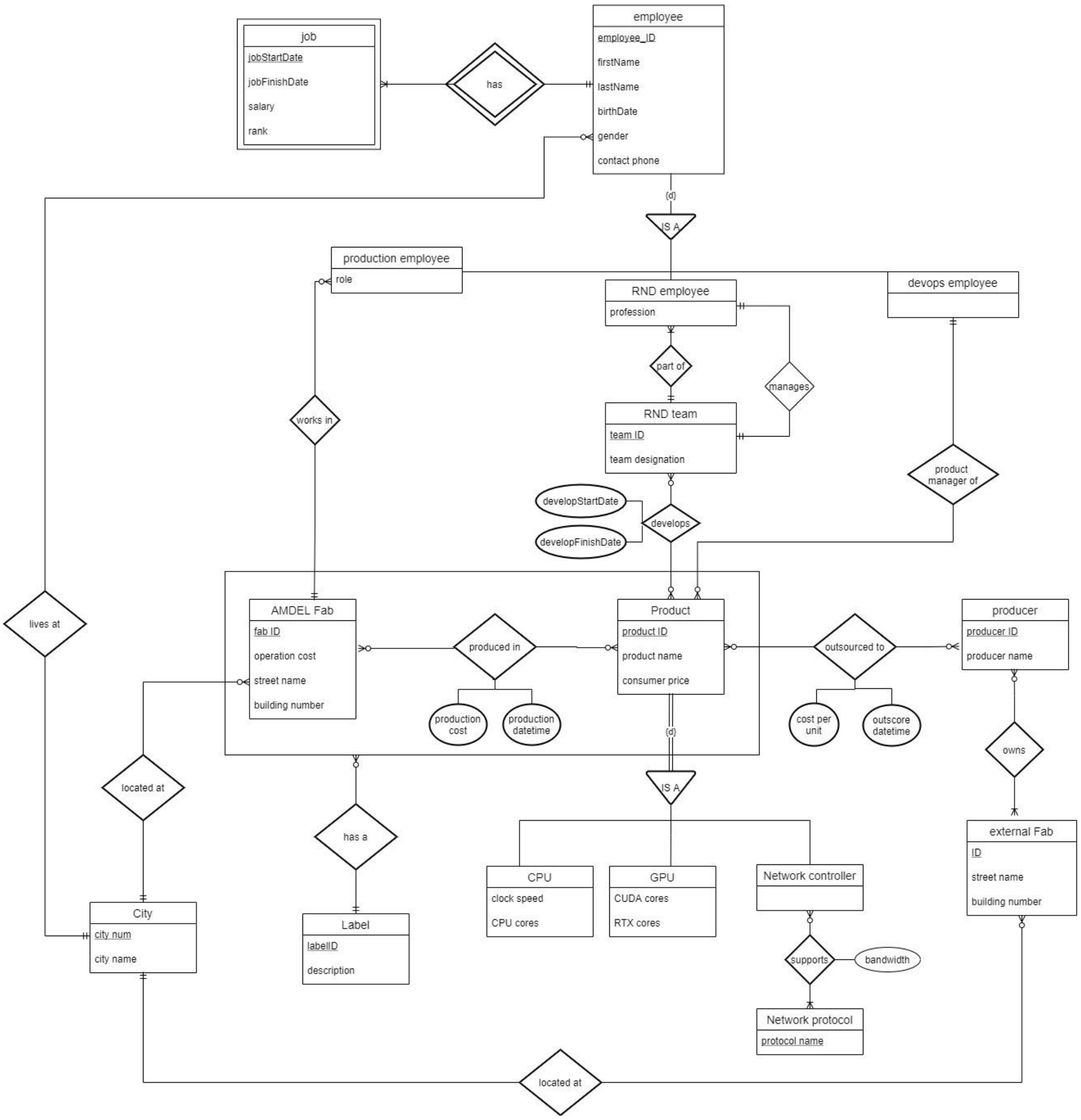
הפקולטה למדעי החברו

ע״ש שמואל והרטה עמיר

פתרון מורחב - תרגיל בית 1



<u>משימות:</u>

תרגמו את תרשים ה- ER לטבלאות 3NF וכתבו את פקודות ה- SQL DDL היוצרות את הטבלאות ב- MySQL.

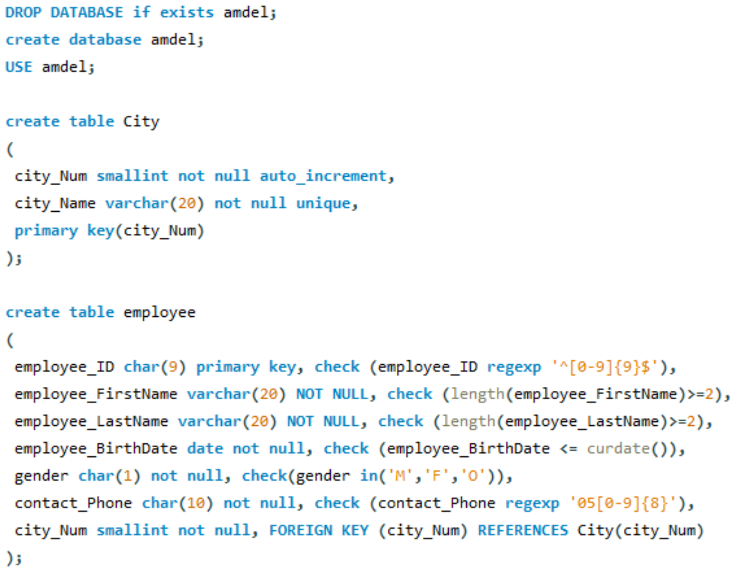
- יש לבחור את סוגי הנתונים בצורה היעילה ביותר.
- יש להגדיר אילוצים על הטבלאות בעת הצורך.

תרגום תרשים ה- ER לטבלאות 3NF:

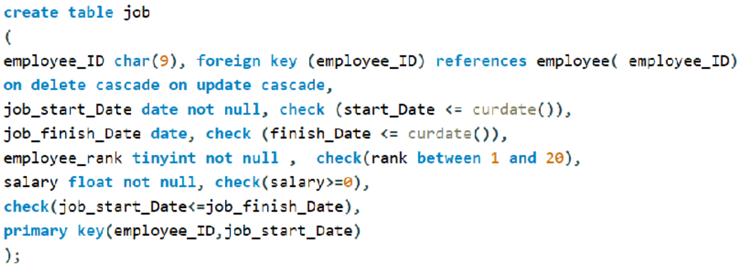
Table name	Fields
employee	Employee_ID, employee_firstname, employee_lastname, gender, employee_birthdate, contact_phone, city_num (FK city)
job	Employee_ID (FK employee), job_start_date , job_finish_date, employee_rank, salary
rnd_employee	Rnd_Employee_ID (FK employee), proffession, team_ID (FK rnd_team)
production _employee	production _employee_ID (FK employee), role ,amdel_fab_ID (FK amdel_fab)
devops_employee	Devops_Employee_ID (FK employee)
rnd_team	Team_ID, Team_Designation, manager_ID (FK RND_employee)
product	Product_ID, product_name, product_consumer_price, devops_employee_ID (FK devops_employee)
cpu	Cpu_product_ID (FK product) , clock_speed, cpu_cores
gpu	Gpu_product_ID (FK product) , cuda_cores ,rtx_cores
network_controller	network_controller_product_ID (FK product)
Network_protocol	Protocol_name
external_fab	external_fab_ID , external _fab_street_name, external_fab_building_num, city_num (FK city)
amdel_fab	amdel_fab_ID, amdel_fab_street_name, amdel_fab_building_num , operation_cost, city_num (FK city)
manages	Team_Designation (FK rnd_team), rnd_employee_ID (FK rnd_employee), rnd_managaer_ID (FK rnd_employee)
supports	Protocol_name (FK Network_protocol) , network_controller_product_ID (FK network_controller), bandwidth
Outsourced_to	Product_ID (FK product) ,producer_ID (FK producer), cost_per_unit, outsourced_datetime
owns	Producer_ID (FK producer), external_fab_ID (FK external_fab)
Produced_in	amdel_fab_ID (FK amdel_fab), product_ID (FK product) ,production_cost, production_datetime
develops	Product_ID (FK product), team_ID (FK rnd_team) , develop_start_date , develop_finish_date

producer	Producer_ID , producer_name
City	City_num, city_name
Label	Label_ID, Label_description
Label_of_product	Label_ID (FK Label), product_id, amdel_fab_id (FK produced_in)

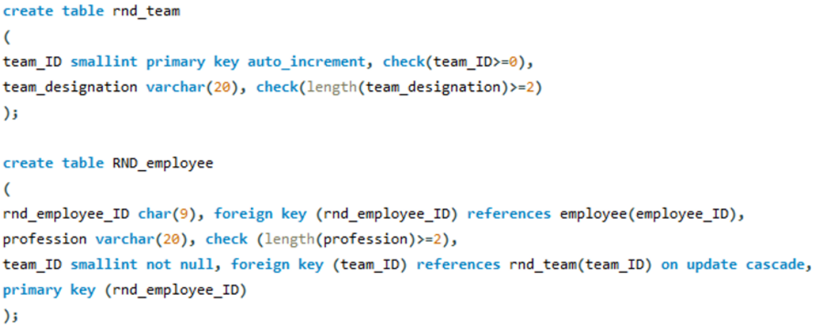
פקודות ה- SQL DDL היוצרות את הטבלאות ב- MySQL:



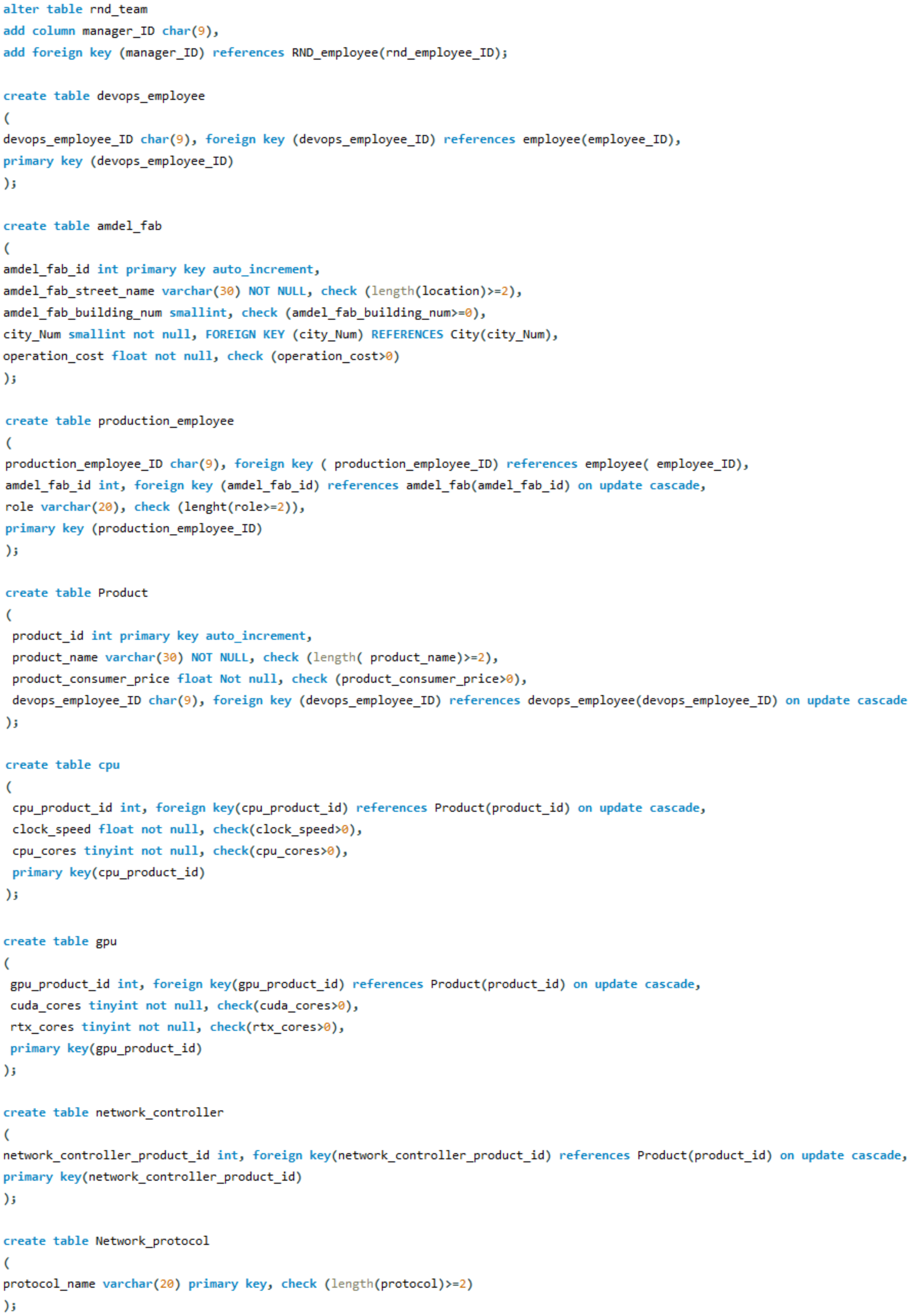
```
DROP DATABASE if exists amdel;
create database amdel;
USE amdel;

create table City
(
 city_Num smallint not null auto_increment,
 city_Name varchar(20) not null unique,
 primary key(city_Num)
);

create table employee
(
 employee_ID char(9) primary key, check (employee_ID regexp '^[0-9]{9}$'),
 employee_FirstName varchar(20) NOT NULL, check (length(employee_FirstName)>=2),
 employee_LastName varchar(20) NOT NULL, check (length(employee_LastName)>=2),
 employee_BirthDate date not null, check (employee_BirthDate <= curdate()),
 gender char(1) not null, check(gender in('M','F','O')),
 contact_Phone char(10) not null, check (contact_Phone regexp '05[0-9]{8}'),
 city_Num smallint not null, FOREIGN KEY (city_Num) REFERENCES City(city_Num)
);
```



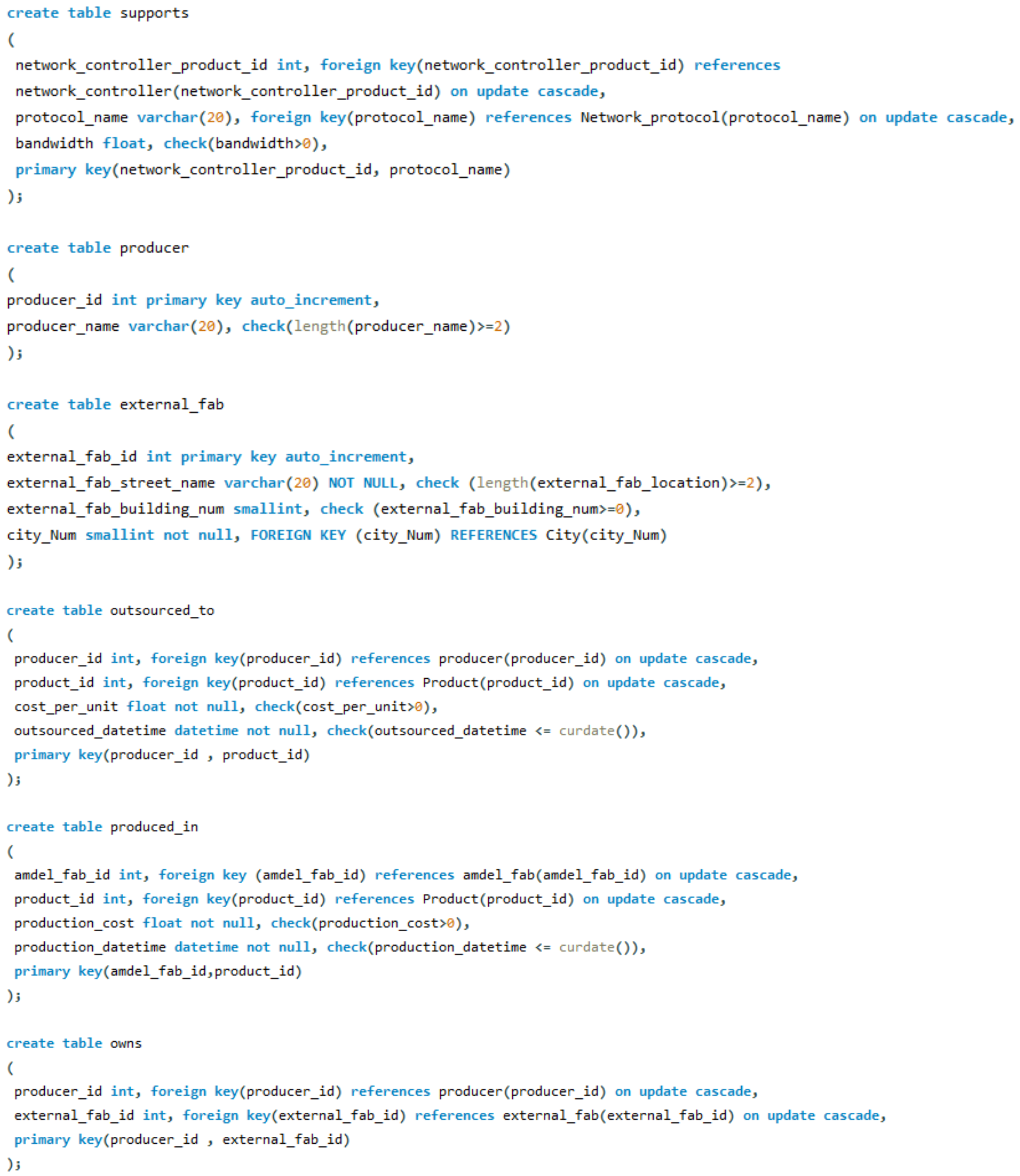
```
create table job
(
employee_ID char(9), foreign key (employee_ID) references employee( employee_ID)
on delete cascade on update cascade,
job_start_Date date not null, check (start_Date <= curdate()),
job_finish_Date date, check (finish_Date <= curdate()),
employee_rank tinyint not null ,  check(rank between 1 and 20),
salary float not null, check(salary>=0),
check(job_start_Date<=job_finish_Date),
primary key(employee_ID,job_start_Date)
);
```



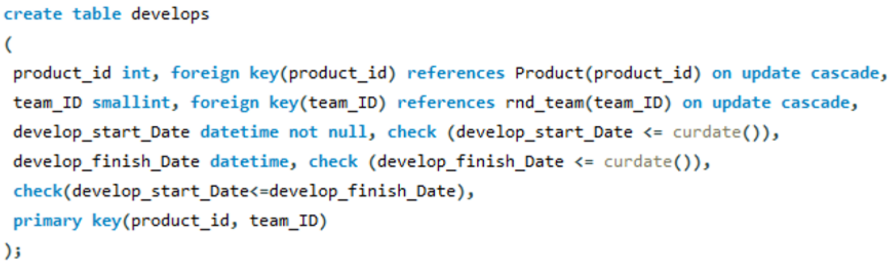
```
create table rnd_team
(
team_ID smallint primary key auto_increment, check(team_ID>=0),
team_designation varchar(20), check(length(team_designation)>=2)
);

create table RND_employee
(
rnd_employee_ID char(9), foreign key (rnd_employee_ID) references employee(employee_ID),
profession varchar(20), check (length(profession)>=2),
team_ID smallint not null, foreign key (team_ID) references rnd_team(team_ID) on update cascade,
primary key (rnd_employee_ID)
);
```



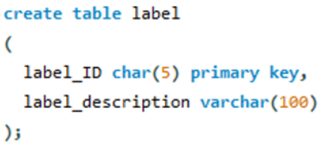
```
alter table rnd_team
add column manager_ID char(9),
add foreign key (manager_ID) references RND_employee(rnd_employee_ID);

create table devops_employee
(
devops_employee_ID char(9), foreign key (devops_employee_ID) references employee(employee_ID),
primary key (devops_employee_ID)
);

create table amdel_fab
(
amdel_fab_id int primary key auto_increment,
amdel_fab_street_name varchar(30) NOT NULL, check (length(location)>=2),
amdel_fab_building_num smallint, check (amdel_fab_building_num>=0),
city_Num smallint not null, FOREIGN KEY (city_Num) REFERENCES City(city_Num),
operation_cost float not null, check (operation_cost>0)
);

create table production_employee
(
production_employee_ID char(9), foreign key ( production_employee_ID) references employee( employee_ID),
amdel_fab_id int, foreign key (amdel_fab_id) references amdel_fab(amdel_fab_id) on update cascade,
role varchar(20), check (lenght(role>=2)),
primary key (production_employee_ID)
);

create table Product
(
 product_id int primary key auto_increment,
 product_name varchar(30) NOT NULL, check (length( product_name)>=2),
 product_consumer_price float Not null, check (product_consumer_price>0),
 devops_employee_ID char(9), foreign key (devops_employee_ID) references devops_employee(devops_employee_ID) on update cascade
);

create table cpu
(
 cpu_product_id int, foreign key(cpu_product_id) references Product(product_id) on update cascade,
 clock_speed float not null, check(clock_speed>0),
 cpu_cores tinyint not null, check(cpu_cores>0),
 primary key(cpu_product_id)
);

create table gpu
(
 gpu_product_id int, foreign key(gpu_product_id) references Product(product_id) on update cascade,
 cuda_cores tinyint not null, check(cuda_cores>0),
 rtx_cores tinyint not null, check(rtx_cores>0),
 primary key(gpu_product_id)
);

create table network_controller
(
network_controller_product_id int, foreign key(network_controller_product_id) references Product(product_id) on update cascade,
primary key(network_controller_product_id)
);

create table Network_protocol
(
protocol_name varchar(20) primary key, check (length(protocol)>=2)
);
```



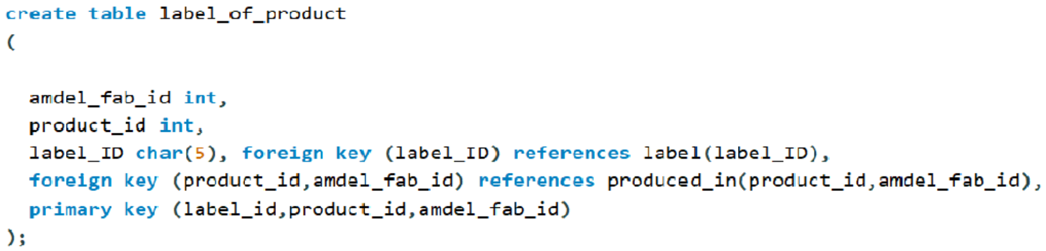
```
create table supports
(
 network_controller_product_id int, foreign key(network_controller_product_id) references
 network_controller(network_controller_product_id) on update cascade,
 protocol_name varchar(20), foreign key(protocol_name) references Network_protocol(protocol_name) on update cascade,
 bandwidth float, check(bandwidth>0),
 primary key(network_controller_product_id, protocol_name)
);

create table producer
(
producer_id int primary key auto_increment,
producer_name varchar(20), check(length(producer_name)>=2)
);

create table external_fab
(
external_fab_id int primary key auto_increment,
external_fab_street_name varchar(20) NOT NULL, check (length(external_fab_location)>=2),
external_fab_building_num smallint, check (external_fab_building_num>=0),
city_Num smallint not null, FOREIGN KEY (city_Num) REFERENCES City(city_Num)
);

create table outsourced_to
(
 producer_id int, foreign key(producer_id) references producer(producer_id) on update cascade,
 product_id int, foreign key(product_id) references Product(product_id) on update cascade,
 cost_per_unit float not null, check(cost_per_unit>0),
 outsourced_datetime datetime not null, check(outsourced_datetime <= curdate()),
 primary key(producer_id , product_id)
);

create table produced_in
(
 amdel_fab_id int, foreign key (amdel_fab_id) references amdel_fab(amdel_fab_id) on update cascade,
 product_id int, foreign key(product_id) references Product(product_id) on update cascade,
 production_cost float not null, check(production_cost>0),
 production_datetime datetime not null, check(production_datetime <= curdate()),
 primary key(amdel_fab_id,product_id)
);

create table owns
(
 producer_id int, foreign key(producer_id) references producer(producer_id) on update cascade,
 external_fab_id int, foreign key(external_fab_id) references external_fab(external_fab_id) on update cascade,
 primary key(producer_id , external_fab_id)
);
```



```
create table develops
(
 product_id int, foreign key(product_id) references Product(product_id) on update cascade,
 team_ID smallint, foreign key(team_ID) references rnd_team(team_ID) on update cascade,
 develop_start_Date datetime not null, check (develop_start_Date <= curdate()),
 develop_finish_Date datetime, check (develop_finish_Date <= curdate()),
 check(develop_start_Date<=develop_finish_Date),
 primary key(product_id, team_ID)
);
```



```
create table label
(
  label_ID char(5) primary key,
  label_description varchar(100)
);
```



```
create table label_of_product
(

  amdel_fab_id int,
  product_id int,
  label_ID char(5), foreign key (label_ID) references label(label_ID),
  foreign key (product_id,amdel_fab_id) references produced_in(product_id,amdel_fab_id),
  primary key (label_id,product_id,amdel_fab_id)
);
```