**System requirements**

The system describes the movement of trains between different stations,

allocation of workers between different stations and railway routes,and shows passenger statistics between different destinations.

The purpose of the system:

To optimize the train traffic (preventing delays), adjusting the number of passengers to the train route / wagons, according to demand.

**General description**

Train station has a name,adress and platforms.Every platform has a platform number.

Route has route number(starts with 100,+100 for opposite route number),origin train station,destination train station,day and scheduled time for departure.

Actual route has route number,train numberdate,time of departure and number of passengers.

Each Train is made of 5 wagons and has it's own train number(starts from 1000) and type (Electric/Steam/Diesel).

Wagon has wagon number(starts with 5001),train number, type of wagon(One floor/Two floor/ Accessible to the disabled/Reserved seats) and capacity.

Ticket of type "Regular" starts with ticket numer 9000,ticket of type "Student"

starts with 9200,type "Pensioner" starts with 9400 and type "Disabled" starts with 9600.Everey ticket has it's own price depends on the type of the ticket and the route.

On each train there are employees that divided into conductors and train drivers.The employees has id number,name and date of birth.  
In addition,the train driver has years of experience and the conductor has the number of tickets he checked.

Crew has route number and employee id.

Stopover has train station name and route number.

**2 user types of the system**

Train driver-

Receiving information that helps to : schedule shifts, plan the duration of stopover times ,help to know which employee he is working with.

Department of Transportation -

Receiving information that helps to :manage the trains schedule , wagons and employees allocation based on load cases and demands for tickets. Also receiving information about stations profits.

**Description of Entities**

Train station - Name ,Address .

Platform - Platform number, Train station name.

Route - Route number, Origin, Destination, Day, Time.

Actual route -Route number, Date, Time, Train number, Number of passengers.

Ticket - Ticket number, Type (Regular, Student, Disabled, Reserved seat) , Price, Route number.

Train - Train number ,Type.

Employee - Id, name, Date of birth.

Conductor - Id ,Number of checked tickets.

Train driver - Id ,Years of experience.

Wagon - Wagon number, Train number, Capacity, Type.

**Normalization**

In our project we used the rules of normalization.

Each table contains atomic values and it’s key contains values(not null).  
All attributes are dependent on the primary key.

 No attribute is dependent on only a portion of the primary key.

CREATE SCHEMA trainDataBase;

use trainDataBase;

create table Train\_Station

(

Name varchar(100) NOT NULL,

Address varchar(100) NOT NULL,

PRIMARY KEY(Name)

)

ENGINE=InnoDB;

create table Platform

(

Platform\_Num int NOT NULL,

Train\_Station\_Name varchar(100) NOT NULL,

PRIMARY KEY (Platform\_Num,Train\_Station\_Name) ,

constraint fk\_tsn foreign key(Train\_Station\_Name) references Train\_Station(Name)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Route

(

Route\_Num int NOT NULL,

Origin varchar(100) NOT NULL,

Destination varchar(100) NOT NULL,

Day varchar(100) NOT NULL,

Time time NOT NULL,

PRIMARY KEY(Route\_Num)

)

ENGINE=InnoDB;

create table Train

(

Train\_Num int NOT NULL,

Type varchar(100) NOT NULL,

PRIMARY KEY(Train\_Num)

)

ENGINE=InnoDB;

create table Actual\_Route

(

Route\_Num int NOT NULL,

Train\_Num int NOT NULL,

Date date NOT NULL,

Time time NOT NULL,

Passengers\_Num int,

PRIMARY KEY(route\_num,Train\_Num),

constraint fk\_actRouteNum foreign key(Route\_Num) references Route(Route\_Num)

on update cascade

on delete no action,

constraint fk\_actRouteTrain foreign key(Train\_Num) references Train(Train\_Num)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Ticket

(

Ticket\_Num int NOT NULL,

Route\_Num int NOT NULL,

Type varchar(100) NOT NULL,

Price float4 ,

PRIMARY KEY(Ticket\_Num,Route\_Num),

constraint fk\_tckt foreign key(Route\_Num) references Actual\_Route(Route\_Num)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Employee

(

Id int NOT NULL,

Train\_Num int NOT NULL,

Name varchar(100) NOT NULL,

DOB date NOT NULL,

PRIMARY KEY(Id,Train\_Num),

)

ENGINE=InnoDB;

create table Conductor

(

Id int NOT NULL,

Checked\_Tickets\_Num int NOT NULL,

PRIMARY KEY(Id),

constraint fk\_cond foreign key(Id) references Employee(Id)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Train\_Driver

(

Id int NOT NULL,

Years\_Of\_Exp int,

PRIMARY KEY(Id),

constraint fk\_driEmp foreign key(Id) references Employee(Id)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Wagon

(

Wagon\_Num int NOT NULL,

Train\_Num int NOT NULL,

Capacity int,

Type varchar(100) NOT NULL NOT NULL,

PRIMARY KEY(Wagon\_Num,Train\_Num),

constraint fk\_wgn foreign key(Train\_Num) references Train(Train\_Num)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Stopover

(

Train\_Station\_Name varchar(100) NOT NULL,

Route\_Num int NOT NULL,

constraint fk\_stpStationName foreign key(Train\_Station\_Name) references Train\_Station(Name)

on update cascade

on delete no action,

constraint fk\_stpRouteNum foreign key(Route\_Num) references Route(Route\_Num)

on update cascade

on delete no action

)

ENGINE=InnoDB;

create table Crew

(

Employee\_Id int NOT NULL,

Route\_Num int NOT NULL,

constraint fk\_crewEmp foreign key(Employee\_Id) references Employee(Id)

on update cascade

on delete no action,

constraint fk\_crewRoute foreign key(Route\_Num) references Actual\_Route(Route\_Num)

on update cascade

on delete no action

)

ENGINE=InnoDB;

**Insertion**

Insert into  Train\_Station Values

('Ashkelon','Power Center'),

('Ashdod','Ashdod Ad Halom Junction'),

('Beer Sheva Merkaz','Ben Zvi 8'),

('Jerusalem Malha','Izhak Modai 1'),

('Rishon LeZion Harishonim','Herzel 149'),

('Lod','Yoseftal 5'),

('Rosh HaAyin Tzafon','Kesem Junction'),

('Tel-Aviv University','Izik Ramba,Merkaz HaYeridim'),

('Tel-Aviv HaShalom','Givat HaTahmoshet 10'),

('Netanya','Dereh Harakevet 5'),

('Beit Shean','Road 71,In Front Of Kibutz Sde Nahum'),

('Haifa Hof HaCarmel','Andrey Saharov'),

('Haifa Bat Galim','Aliat HaNoar'),

('Naharia','HaGaaton 1');

Insert into  Platform Values

(1, (SELECT Name from Train\_Station WHERE Name='Ashkelon')),

(2, (SELECT Name from Train\_Station WHERE Name='Ashkelon')),

(1, (SELECT Name from Train\_Station WHERE Name='Ashdod')),

(2, (SELECT Name from Train\_Station WHERE Name='Ashdod')),

(1, (SELECT Name from Train\_Station WHERE Name='Beer Sheva Merkaz')),

(2, (SELECT Name from Train\_Station WHERE Name='Beer Sheva Merkaz')),

(3, (SELECT Name from Train\_Station WHERE Name='Beer Sheva Merkaz')),

(4, (SELECT Name from Train\_Station WHERE Name='Beer Sheva Merkaz')),

(1, (SELECT Name from Train\_Station WHERE Name='Jerusalem Malha')),

(2, (SELECT Name from Train\_Station WHERE Name='Jerusalem Malha')),

(3, (SELECT Name from Train\_Station WHERE Name='Jerusalem Malha')),

(4, (SELECT Name from Train\_Station WHERE Name='Jerusalem Malha')),

(1, (SELECT Name from Train\_Station WHERE Name='Rishon LeZion Harishonim')),

(2, (SELECT Name from Train\_Station WHERE Name='Rishon LeZion Harishonim')),

(1, (SELECT Name from Train\_Station WHERE Name='Lod')),

(2, (SELECT Name from Train\_Station WHERE Name='Lod')),

(3, (SELECT Name from Train\_Station WHERE Name='Lod')),

(4, (SELECT Name from Train\_Station WHERE Name='Lod')),

(1, (SELECT Name from Train\_Station WHERE Name='Rosh HaAyin Tzafon')),

(2, (SELECT Name from Train\_Station WHERE Name='Rosh HaAyin Tzafon')),

(1, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv University')),

(2, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv University')),

(3, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv University')),

(4, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv University')),

(1, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom')),

(2, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom')),

(3, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom')),

(4, (SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom')),

(1, (SELECT Name from Train\_Station WHERE Name='Netanya')),

(2, (SELECT Name from Train\_Station WHERE Name='Netanya')),

(1, (SELECT Name from Train\_Station WHERE Name='Beit Shean')),

(2, (SELECT Name from Train\_Station WHERE Name='Beit Shean')),

(1, (SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel')),

(2, (SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel')),

(3, (SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel')),

(4, (SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel')),

(1, (SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim')),

(2, (SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim')),

(3, (SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim')),

(4, (SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim')),

(1, (SELECT Name from Train\_Station WHERE Name='Naharia')),

(2, (SELECT Name from Train\_Station WHERE Name='Naharia')),

Insert into  Route Values

(100,'Beer Sheva Merkaz','Naharia','Sunday','10:30'),

(200,'Naharia','Beer Sheva Merkaz','Sunday','18:30'),

(101,'Haifa Hof HaCarmel','Jerusalem Malha','Monday','06:30'),

(201,'Jerusalem Malha','Haifa Hof HaCarmel','Thursday','7:40'),

(102,'Beit Shean','Ashkelon','Friday','10:30'),

(202,'Ashkelon','Beit Shean','Wednesday','10:30'),

(103,'Ashdod','Haifa Bat Galim','Thursday','16:26'),

(203,'Haifa Bat Galim','Ashdod','Monday','20:18'),

(104,'Tel-Aviv University','Beer Sheva Merkaz','Saturday','21:40'),

(204,'Beer Sheva Merkaz','Tel-Aviv University','Thursday','12:55'),

(105,'Jerusalem Malha','Naharia','Friday','11:49'),

(205,'Naharia','Jerusalem Malha','Sunday','17:34'),

(106,'Jerusalem Malha','Tel-Aviv HaShalom','Monday','14:08'),

(206,'Tel-Aviv HaShalom','Jerusalem Malha','Thursday','19:44');

Insert into Train Values

(1000,'Electric'),

(1001,'Steam'),

(1002,'Diesel'),

(1003,'Diesel'),

(1004,'Diesel'),

(1005,'Electric'),

(1006,'Steam'),

(1007,'Steam'),

(1008,'Electric'),

(1009,'Diesel'),

(1010,'Steam'),

(1011,'Diesel'),

(1012,'Steam'),

(1013,'Electric');

Insert into Wagon Values

(5001,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),50,'One floor'),

(5002,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),50,'One floor'),

(5003,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),50,'One floor'),

(5004,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),50,'One floor'),

(5005,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),20,'Accessible to the disabled'),

(5006,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),100,'Two floor'),

(5007,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),100,'Two floor'),

(5008,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),100,'Two floor'),

(5009,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),100,'Two floor'),

(5010,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),20,'Accessible to the disabled'),

(5011,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),50,'One floor'),

(5012,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),50,'One floor'),

(5013,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),50,'One floor'),

(5014,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),50,'One floor'),

(5015,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),20,'Accessible to the disabled'),

(5016,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),50,'One floor'),

(5017,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),50,'One floor'),

(5018,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),50,'One floor'),

(5019,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),50,'One floor'),

(5020,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),20,'Accessible to the disabled'),

(5021,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),100,'Two floor'),

(5022,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),100,'Two floor'),

(5023,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),100,'Two floor'),

(5024,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),100,'Two floor'),

(5025,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),20,'Reserved seats'),

(5026,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),50,'One floor'),

(5027,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),50,'One floor'),

(5028,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),50,'One floor'),

(5029,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),50,'One floor'),

(5030,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),20,'Reserved seats'),

(5031,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),50,'One floor'),

(5032,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),50,'One floor'),

(5033,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),50,'One floor'),

(5034,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),50,'One floor'),

(5035,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),20,'Reserved seats'),

(5036,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),100,'Two floor'),

(5037,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),100,'Two floor'),

(5038,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),100,'Two floor'),

(5039,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),100,'Two floor'),

(5040,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),20,'Accessible to the disabled’),

(5041,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),50,'One floor'),

(5042,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),50,'One floor'),

(5043,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),50,'One floor'),

(5044,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),50,'One floor'),

(5045,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),20,'Accessible to the disabled'),

(5046,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),100,'Two floor'),

(5047,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),100,'Two floor'),

(5048,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),100,'Two floor'),

(5049,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),100,'Two floor'),

(5050,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),20,'Reserved seats'),

(5051,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),50,'One floor'),

(5052,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),50,'One floor'),

(5053,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),50,'One floor'),

(5054,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),50,'One floor'),

(5055,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),20,'Accessible to the disabled'),

(5056,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),100,'Two floor'),

(5057,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),100,'Two floor'),

(5058,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),100,'Two floor'),

(5059,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),100,'Two floor'),

(5060,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),20,'Reserved seats'),

(5061,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),50,'One floor'),

(5062,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),50,'One floor'),

(5063,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),50,'One floor'),

(5064,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),50,'One floor'),

(5065,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),20,’Reserved seats'),

(5066,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),100,'Two floor'),

(5067,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),100,'Two floor'),

(5068,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),100,'Two floor'),

(5069,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),100,'Two floor'),

(5070,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),20,'Accessible to the disabled');

Insert into  Actual\_Route Values

((SELECT Route\_Num from Route WHERE Route\_Num='100'),(SELECT Train\_Num from Train WHERE Train\_Num='1000'),'2021-05-23','10:36',0),

((SELECT Route\_Num from Route WHERE Route\_Num='200'),(SELECT Train\_Num from Train WHERE Train\_Num='1001'),'2021-05-23','18:32',0),

((SELECT Route\_Num from Route WHERE Route\_Num='101'),(SELECT Train\_Num from Train WHERE Train\_Num='1002'),'2021-05-24','06:41',0),

((SELECT Route\_Num from Route WHERE Route\_Num='201'),(SELECT Train\_Num from Train WHERE Train\_Num='1003'),'2021-05-27','07:44',0),

((SELECT Route\_Num from Route WHERE Route\_Num='102'),(SELECT Train\_Num from Train WHERE Train\_Num='1004'),'2021-05-28','10:31',0),

((SELECT Route\_Num from Route WHERE Route\_Num='202'),(SELECT Train\_Num from Train WHERE Train\_Num='1005'),'2021-05-26','10:30',0),

((SELECT Route\_Num from Route WHERE Route\_Num='103'),(SELECT Train\_Num from Train WHERE Train\_Num='1006'),'2021-05-27','16:28',0),

((SELECT Route\_Num from Route WHERE Route\_Num='203),(SELECT Train\_Num from Train WHERE Train\_Num='1007'),'2021-05-24','20:19'02),

((SELECT Route\_Num from Route WHERE Route\_Num='104'),(SELECT Train\_Num from Train WHERE Train\_Num='1008'),'2021-05-29','21:40',0),

((SELECT Route\_Num from Route WHERE Route\_Num='204'),(SELECT Train\_Num from Train WHERE Train\_Num='1009'),'2021-05-27','12:55',0),

((SELECT Route\_Num from Route WHERE Route\_Num='105'),(SELECT Train\_Num from Train WHERE Train\_Num='1010'),'2021-05-28','11:50',0),

((SELECT Route\_Num from Route WHERE Route\_Num='205'),(SELECT Train\_Num from Train WHERE Train\_Num='1011'),'2021-05-23','17:39',0),

((SELECT Route\_Num from Route WHERE Route\_Num='106'),(SELECT Train\_Num from Train WHERE Train\_Num='1012'),'2021-05-24','14:08',0),

((SELECT Route\_Num from Route WHERE Route\_Num='206'),(SELECT Train\_Num from Train WHERE Train\_Num='1013'),'2021-05-27','19:46',0);

Insert into  Ticket Values

(9000,(SELECT Route\_Num from Route WHERE Route\_Num='100'),'Regular',64.50),

(9200,(SELECT Route\_Num from Route WHERE Route\_Num='100'),'Student',32.00),

(9400,(SELECT Route\_Num from Route WHERE Route\_Num='100'),'Pensioner',32.00),

(9600,(SELECT Route\_Num from Route WHERE Route\_Num='100'),'Disabled',64.50),

(9001,(SELECT Route\_Num from Route WHERE Route\_Num='200'),'Regular',64.50),

(9201,(SELECT Route\_Num from Route WHERE Route\_Num='200'),'Student',32.00),

(9401,(SELECT Route\_Num from Route WHERE Route\_Num='200'),'Pensioner',32.00),

(9601,(SELECT Route\_Num from Route WHERE Route\_Num='200'),'Disabled',64.50),

(9002,(SELECT Route\_Num from Route WHERE Route\_Num='101'),'Regular',42.00),

(9202,(SELECT Route\_Num from Route WHERE Route\_Num='101'),'Student',21.00),

(9402,(SELECT Route\_Num from Route WHERE Route\_Num='101'),'Pensioner',21.00),

(9602,(SELECT Route\_Num from Route WHERE Route\_Num='101'),'Disabled',42.00),

(9003,(SELECT Route\_Num from Route WHERE Route\_Num='201'),'Regular',42.00),

(9203,(SELECT Route\_Num from Route WHERE Route\_Num='201'),'Student',21.00),

(9403,(SELECT Route\_Num from Route WHERE Route\_Num='201'),'Pensioner',21.00),

(9603,(SELECT Route\_Num from Route WHERE Route\_Num='201'),'Disabled',42.00),

(9004,(SELECT Route\_Num from Route WHERE Route\_Num='102'),'Regular',56.00),

(9204,(SELECT Route\_Num from Route WHERE Route\_Num='102'),'Student',28.00),

(9404,(SELECT Route\_Num from Route WHERE Route\_Num='102'),'Pensioner',28.00),

(9604,(SELECT Route\_Num from Route WHERE Route\_Num='102'),'Disabled',56.00),

(9005,(SELECT Route\_Num from Route WHERE Route\_Num='202'),'Regular',56.00),

(9205,(SELECT Route\_Num from Route WHERE Route\_Num='202'),'Student',28.00),

(9405,(SELECT Route\_Num from Route WHERE Route\_Num='202'),'Pensioner',28.00),

(9605,(SELECT Route\_Num from Route WHERE Route\_Num='202'),'Disabled',56.00),

(9006,(SELECT Route\_Num from Route WHERE Route\_Num='103'),'Regular',38.50),

(9206,(SELECT Route\_Num from Route WHERE Route\_Num='103'),'Student',19.00),

(9406,(SELECT Route\_Num from Route WHERE Route\_Num='103'),'Pensioner',19.00),

(9606,(SELECT Route\_Num from Route WHERE Route\_Num='103'),'Disabled',38.50),

(9007,(SELECT Route\_Num from Route WHERE Route\_Num='203),'Regular',38.50),

(9207,(SELECT Route\_Num from Route WHERE Route\_Num='203),'Student',19.00),

(9407,(SELECT Route\_Num from Route WHERE Route\_Num='203),'Pensioner',19.00),

(9607,(SELECT Route\_Num from Route WHERE Route\_Num='203),'Disabled',38.50),

(9008,(SELECT Route\_Num from Route WHERE Route\_Num='104'),'Regular',26.50),

(9208,(SELECT Route\_Num from Route WHERE Route\_Num='104'),'Student',13.00),

(9408,(SELECT Route\_Num from Route WHERE Route\_Num='104'),'Pensioner',13.00),

(9608,(SELECT Route\_Num from Route WHERE Route\_Num='104'),'Disabled',26.50),

(9009,(SELECT Route\_Num from Route WHERE Route\_Num='204'),'Regular',26.50),

(9209,(SELECT Route\_Num from Route WHERE Route\_Num='204'),'Student',13.00),

(9409,(SELECT Route\_Num from Route WHERE Route\_Num='204'),'Pensioner',13.00),

(9609,(SELECT Route\_Num from Route WHERE Route\_Num='204'),'Disabled',26.50),

(9010,(SELECT Route\_Num from Route WHERE Route\_Num='105'),'Regular',53.50),

(9210,(SELECT Route\_Num from Route WHERE Route\_Num='105'),'Student',26.50),

(9410,(SELECT Route\_Num from Route WHERE Route\_Num='105'),'Pensioner',26.50),

(9610,(SELECT Route\_Num from Route WHERE Route\_Num='105'),'Disabled',53.50),

(9011,(SELECT Route\_Num from Route WHERE Route\_Num='205'),'Regular',53.50),

(9211,(SELECT Route\_Num from Route WHERE Route\_Num='205'),'Student',26.50),

(9411,(SELECT Route\_Num from Route WHERE Route\_Num='205'),'Pensioner',26.50),

(9611,(SELECT Route\_Num from Route WHERE Route\_Num='205'),'Disabled',53.50),

(9012,(SELECT Route\_Num from Route WHERE Route\_Num='106'),'Regular',19.50),

(9212,(SELECT Route\_Num from Route WHERE Route\_Num='106'),'Student',9.50),

(9412,(SELECT Route\_Num from Route WHERE Route\_Num='106'),'Pensioner',9.50),

(9612,(SELECT Route\_Num from Route WHERE Route\_Num='106'),'Disabled',19.50),

(9013,(SELECT Route\_Num from Route WHERE Route\_Num='206'),'Regular',19.50),

(9213,(SELECT Route\_Num from Route WHERE Route\_Num='206'),'Student',9.50),

(9413,(SELECT Route\_Num from Route WHERE Route\_Num='206'),'Pensioner',9.50),

(9613,(SELECT Route\_Num from Route WHERE Route\_Num='206'),'Disabled',19.50);

Insert into Employee Values

(1,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),'Moshe Cohen','1977-06-30'),

(2,(SELECT Train\_Num from Train WHERE Train\_Num='1000'),'Yosef Levi','1990-11-15'),

(3,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),'Yarden Zehavi','1991-08-10'),

(4,(SELECT Train\_Num from Train WHERE Train\_Num='1001'),'Simha Gora','1986-12-27'),

(5,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),'Eli Kopter','1996-03-14'),

(6,(SELECT Train\_Num from Train WHERE Train\_Num='1002'),'Josh Katz','2000-02-21'),

(7,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),'Eitan Kohavi','1983-08-11'),

(8,(SELECT Train\_Num from Train WHERE Train\_Num='1003'),'Binyamin Shamir','1961-01-09'),

(9,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),'Ron Butbul','1982-09-02'),

(10,(SELECT Train\_Num from Train WHERE Train\_Num='1004'),'Eyal Goldshtein','1989-04-06'),

(11,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),'Daniel Izhak','1996-07-28'),

(12,(SELECT Train\_Num from Train WHERE Train\_Num='1005'),'Guy Lavi','1993-10-14'),

(13,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),'Eden Bahar','1997-06-11'),

(14,(SELECT Train\_Num from Train WHERE Train\_Num='1006'),'Maya Katz','1985-02-17'),

(15,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),'Ilanit Peretz','1977-05-26'),

(16,(SELECT Train\_Num from Train WHERE Train\_Num='1007'),'Shimon Dayan','1974-10-04'),

(17,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),'Adi Simhi','1987-03-21'),

(18,(SELECT Train\_Num from Train WHERE Train\_Num='1008'),'Miki Bender','1998-11-08'),

(19,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),'Raz Haim','1992-05-31'),

(20,(SELECT Train\_Num from Train WHERE Train\_Num='1009'),'Tom Solomon','1990-01-10'),

(21,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),'Moshe Cohen','2002-09-12'),

(22,(SELECT Train\_Num from Train WHERE Train\_Num='1010'),'Yosef Levi','1990-11-11'),

(23,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),'Yaakov Oren','1979-07-14'),

(24,(SELECT Train\_Num from Train WHERE Train\_Num='1011'),'Schahar Avraham','1975-06-09'),

(25,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),'Eylon Simantov','1994-04-16'),

(26,(SELECT Train\_Num from Train WHERE Train\_Num='1012'),'Almog Naim','1987-10-18'),

(27,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),'David Nissim','1995-07-04'),

(28,(SELECT Train\_Num from Train WHERE Train\_Num='1013'),'Shlomi Goldberg','1990-03-26');

Insert into Conductor Values

((SELECT Id from Employee WHERE Id='1'),145),

((SELECT Id from Employee WHERE Id='3'),356),

((SELECT Id from Employee WHERE Id='5'),185),

((SELECT Id from Employee WHERE Id='7'),171),

((SELECT Id from Employee WHERE Id='9'),197),

((SELECT Id from Employee WHERE Id='11'),88),

((SELECT Id from Employee WHERE Id='13'),218),

((SELECT Id from Employee WHERE Id='15'),262),

((SELECT Id from Employee WHERE Id='17'),46),

((SELECT Id from Employee WHERE Id='19'),100),

((SELECT Id from Employee WHERE Id='21'),87),

((SELECT Id from Employee WHERE Id='23'),208),

((SELECT Id from Employee WHERE Id='25'),74),

((SELECT Id from Employee WHERE Id='27'),168);

Insert into Train\_Driver Values

((SELECT Id from Employee WHERE Id='2'),2),

((SELECT Id from Employee WHERE Id='4'),15),

((SELECT Id from Employee WHERE Id='6'),1),

((SELECT Id from Employee WHERE Id='8'),36),

((SELECT Id from Employee WHERE Id='10'),9),

((SELECT Id from Employee WHERE Id='12'),4),

((SELECT Id from Employee WHERE Id='14'),11),

((SELECT Id from Employee WHERE Id='16'),22),

((SELECT Id from Employee WHERE Id='18'),2),

((SELECT Id from Employee WHERE Id='20'),7),

((SELECT Id from Employee WHERE Id='22'),3),

((SELECT Id from Employee WHERE Id='24'),23),

((SELECT Id from Employee WHERE Id='26'),13),

((SELECT Id from Employee WHERE Id='28'),8);

Insert into Stopover Values

((SELECT Name from Train\_Station WHERE Name='Ashdod'),(SELECT Route\_Num from Route WHERE Route\_Num='100')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv University'),(SELECT Route\_Num from Route WHERE Route\_Num='100')),

((SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel'),(SELECT Route\_Num from Route WHERE Route\_Num='100')),

((SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel'),(SELECT Route\_Num from Route WHERE Route\_Num='200')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv University'),(SELECT Route\_Num from Route WHERE Route\_Num='200')),

((SELECT Name from Train\_Station WHERE Name='Ashdod'),(SELECT Route\_Num from Route WHERE Route\_Num='200')),

((SELECT Name from Train\_Station WHERE Name='Netanya'),(SELECT Route\_Num from Route WHERE Route\_Num='101')),

((SELECT Name from Train\_Station WHERE Name='Lod'),(SELECT Route\_Num from Route WHERE Route\_Num='101')),

((SELECT Name from Train\_Station WHERE Name='Lod'),(SELECT Route\_Num from Route WHERE Route\_Num='201')),

((SELECT Name from Train\_Station WHERE Name='Netanya'),(SELECT Route\_Num from Route WHERE Route\_Num='201')),

((SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim'),(SELECT Route\_Num from Route WHERE Route\_Num='102')),

((SELECT Name from Train\_Station WHERE Name='Rosh HaAyin Tzafon'),(SELECT Route\_Num from Route WHERE Route\_Num='102')),

((SELECT Name from Train\_Station WHERE Name='Rishon LeZion Harishonim'),(SELECT Route\_Num from Route WHERE Route\_Num='102')),

((SELECT Name from Train\_Station WHERE Name='Rishon LeZion Harishonim'),(SELECT Route\_Num from Route WHERE Route\_Num='202')),

((SELECT Name from Train\_Station WHERE Name='Rosh HaAyin Tzafon'),(SELECT Route\_Num from Route WHERE Route\_Num='202')),

((SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim'),(SELECT Route\_Num from Route WHERE Route\_Num='202')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom'),(SELECT Route\_Num from Route WHERE Route\_Num='103')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv HaShalom'),(SELECT Route\_Num from Route WHERE Route\_Num='203)),

((SELECT Name from Train\_Station WHERE Name='Ashdod'),(SELECT Route\_Num from Route WHERE Route\_Num='104')),

((SELECT Name from Train\_Station WHERE Name='Ashkelon'),(SELECT Route\_Num from Route WHERE Route\_Num='104')),

((SELECT Name from Train\_Station WHERE Name='Ashkelon'),(SELECT Route\_Num from Route WHERE Route\_Num='204')),

((SELECT Name from Train\_Station WHERE Name='Ashdod'),(SELECT Route\_Num from Route WHERE Route\_Num='204')),

((SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Name from Train\_Station WHERE Name='Netanya'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv University'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Name from Train\_Station WHERE Name='Lod'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Name from Train\_Station WHERE Name='Lod'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Name from Train\_Station WHERE Name='Tel-Aviv University'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Name from Train\_Station WHERE Name='Netanya'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Name from Train\_Station WHERE Name='Haifa Bat Galim'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Name from Train\_Station WHERE Name='Haifa Hof HaCarmel'),(SELECT Route\_Num from Route WHERE Route\_Num='205'));

Insert into Crew Values

((SELECT Id from Employee WHERE Id='1'),(SELECT Route\_Num from Route WHERE Route\_Num='100')),

((SELECT Id from Employee WHERE Id='2'),(SELECT Route\_Num from Route WHERE Route\_Num='100')),

((SELECT Id from Employee WHERE Id='3'),(SELECT Route\_Num from Route WHERE Route\_Num='200')),

((SELECT Id from Employee WHERE Id='4'),(SELECT Route\_Num from Route WHERE Route\_Num='200')),

((SELECT Id from Employee WHERE Id='5'),(SELECT Route\_Num from Route WHERE Route\_Num='101')),

((SELECT Id from Employee WHERE Id='6'),(SELECT Route\_Num from Route WHERE Route\_Num='101')),

((SELECT Id from Employee WHERE Id='7'),(SELECT Route\_Num from Route WHERE Route\_Num='201')),

((SELECT Id from Employee WHERE Id='8'),(SELECT Route\_Num from Route WHERE Route\_Num='201')),

((SELECT Id from Employee WHERE Id='9'),(SELECT Route\_Num from Route WHERE Route\_Num='102')),

((SELECT Id from Employee WHERE Id='10'),(SELECT Route\_Num from Route WHERE Route\_Num='102')),

((SELECT Id from Employee WHERE Id='11'),(SELECT Route\_Num from Route WHERE Route\_Num='202')),

((SELECT Id from Employee WHERE Id='12'),(SELECT Route\_Num from Route WHERE Route\_Num='202')),

((SELECT Id from Employee WHERE Id='13'),(SELECT Route\_Num from Route WHERE Route\_Num='103')),

((SELECT Id from Employee WHERE Id='14'),(SELECT Route\_Num from Route WHERE Route\_Num='103')),

((SELECT Id from Employee WHERE Id='15'),(SELECT Route\_Num from Route WHERE Route\_Num='203)),

((SELECT Id from Employee WHERE Id='16'),(SELECT Route\_Num from Route WHERE Route\_Num='203)),

((SELECT Id from Employee WHERE Id='17'),(SELECT Route\_Num from Route WHERE Route\_Num='104')),

((SELECT Id from Employee WHERE Id='18'),(SELECT Route\_Num from Route WHERE Route\_Num='104')),

((SELECT Id from Employee WHERE Id='19'),(SELECT Route\_Num from Route WHERE Route\_Num='204')),

((SELECT Id from Employee WHERE Id='20'),(SELECT Route\_Num from Route WHERE Route\_Num='204')),

((SELECT Id from Employee WHERE Id='21'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Id from Employee WHERE Id='22'),(SELECT Route\_Num from Route WHERE Route\_Num='105')),

((SELECT Id from Employee WHERE Id='23'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Id from Employee WHERE Id='24'),(SELECT Route\_Num from Route WHERE Route\_Num='205')),

((SELECT Id from Employee WHERE Id='25'),(SELECT Route\_Num from Route WHERE Route\_Num='106')),

((SELECT Id from Employee WHERE Id='26'),(SELECT Route\_Num from Route WHERE Route\_Num='106')),

((SELECT Id from Employee WHERE Id='27'),(SELECT Route\_Num from Route WHERE Route\_Num='206')),

((SELECT Id from Employee WHERE Id='28'),(SELECT Route\_Num from Route WHERE Route\_Num='206'));

UPDATE & DELETE Commands

SELECT Id, Name

FROM Employee

WHERE Employee.Id = 24;

UPDATE Employee

SET Name = 'Momo Avraham’

WHERE Employee.Id = 24;

SELECT Employee.Id, Employee.Name

FROM Employee;

/\*back to previous name\*

/UPDATE Employee

SET Name = 'Schahar Avraham’ WHERE Employee.Id = 24;

/\*\*\*\*\*\*delete the train driver with least years of experience\*\*\*\*\*\*/

SELECT \*FROM Train\_Driver

ORDER BY (Years\_Of\_Exp);

DELETE FROM Train\_Driver

WHERE Train\_Driver.Years\_Of\_Exp = 1;

Insert into Train\_Driver Values((SELECT Id from Employee WHERE Id='6'),1);

/\*\*\*\*\*\*\*\*\*Train\_Driver Select Commands \*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\*1-train ID with the accessible to disabled\*/

SELECT Train.train\_num

FROM Train INNER JOIN Wagon

ON wagon.train\_num = Train.train\_num

WHERE wagon.type = 'Accessible to the disabled’;

/\*2-amount of routes that have a stop at Tel-Aviv HaShalom\*/

SELECT COUNT(Route.route\_num) AS 'Number of Routes’

FROM Route, Stopover

WHERE Route.route\_num = stopover.route\_num AND stopover.Train\_Station\_Name = 'Tel-Aviv HaShalom';

/\*3-Show the number of actual routes that every train has\*/

SELECT train.\*, COUNT(actual\_route.Train\_Num) AS 'Number of routes’

FROM train, actual\_route

WHERE actual\_route.Train\_Num = train.Train\_Num

GROUP BY train.Train\_Num

HAVING (COUNT(actual\_route.Train\_Num) >= 1);

/\*4-Show the details of the routes number that have two or more stopovers and count them\*/

SELECT route.Route\_Num, route.Origin, route.Destination, COUNT(stopover.Train\_Station\_Name) AS 'Number of stopovers’

FROM route, stopover

WHERE route.Route\_Num = stopover.Route\_Num

GROUP BY route.Route\_Num

HAVING (COUNT(stopover.Train\_Station\_Name) >= 2)

ORDER BY COUNT(stopover.Train\_Station\_Name) DESC;

/\*5-Show each train station and its number of platforms\*/

SELECT Train\_Station.Name AS 'Train Station Name’, COUNT(Train\_Station.Name) AS 'Number Of Platforms’

FROM Train\_Station INNER JOIN Platform

ON Train\_Station.Name = Platform.Train\_Station\_Name

GROUP BY Train\_Station.Name

ORDER BY (COUNT(Platform.Platform\_Num)) DESC;

/\*6-Retrieve the routes that stops at haifa,and the number of routes for each route in haifa\*/

SELECT route.\*, stopover.Train\_Station\_Name AS 'First step at haifa', COUNT(stopover.Train\_Station\_Name LIKE '%Haifa%') AS 'Number of stopovers at haifa’

FROM route, stopover

WHERE (route.Route\_Num = stopover.Route\_Num) AND stopover.Train\_Station\_Name LIKE '%Haifa%’

GROUP BY route.Route\_Num;

/\*7-Show the routes and their details with drivers that have more than 10 years of epxperience\*/

SELECT actual\_route.\*

FROM actual\_route INNER JOIN crew

ON crew.route\_num = actual\_route.route\_num INNER JOIN employee ON employee.Id = crew.employee\_ID INNER JOIN train\_driver ON employee.Id = Train\_driver.idWHERE train\_driver.years\_of\_exp > 10

ORDER BY train\_driver.years\_of\_exp;

**/\*\*\*\*\*\*\*\*\*Department of Transportation Select Commands \*\*\*\*\*\*\*\*\*\*\*\*\*\*/**

/\*1-Retrieve The Employees older than 45\*/

SELECT Name, DOB, DATEDIFF(CURDATE(), Employee.DOB) / 365 AS Age

FROM Employee

DATEDIFF(CURDATE(), Employee.DOB) / 365 > 45;

/\*2-Retrieve list of train drivers by years of experience\*/

SELECT employee.\*, train\_driver.Years\_Of\_Exp

FROM train\_driver, employee

WHERE employee.Id = train\_driver.Id

ORDER BY Years\_Of\_Exp DESC;

/\*3-Retrieve the routes that left behind schedule\*/

SELECT Route.Route\_Num, Route.time AS ScheduledTime, Actual\_Route.time AS ActualDepartureTime

FROM Route, Actual\_Route

WHERE (Actual\_Route.time > Route.time && Route.Route\_Num = Actual\_Route.Route\_Num)ORDER BY ScheduledTime DESC;

/\*4-Retrieve the most experienced train driver and the conductor that checked the most tickets\*/

SELECT Train\_Driver.Id AS TrainDriverId, MAX(Years\_Of\_Exp) AS YearsOfExp, Conductor.Id AS ConductorId, MAX(Checked\_Tickets\_Num) AS CheckedTicketsFROM Employee, Train\_Driver, Conductor

WHERE Years\_Of\_Exp = (SELECT MAX(Years\_Of\_Exp) FROM Train\_Driver) AND Checked\_Tickets\_Num = (SELECT MAX(Checked\_Tickets\_Num) FROM Conductor);

/\*5-Retrieve the trains that includes more than 1 wagon of type'Two floor' and it's number\*/

SELECT train.\*, COUNT(wagon.Wagon\_Num) AS 'Number of wagons’

FROM train, wagon

WHERE (wagon.Train\_Num = train.Train\_Num) AND (wagon.Type LIKE 'Two floor’)

GROUP BY train.Train\_NumHAVING (COUNT(wagon.Wagon\_Num) > 1);

/\*6-Sum all tickets price that used in 'Monday’\*/

SELECT SUM(ticket.price) as 'Shekels’

FROM ticket INNER JOIN actual\_route

ON ticket.route\_num = actual\_route.route\_num INNER JOIN route

ON route.route\_num = actual\_route.route\_numWHERE route.day = 'Monday';

/\*7-Retrieve the number of tickets of type 'Student' that took 'Electric' Train\*/

SELECT COUNT(Ticket.Ticket\_Num) AS 'Number Of Tickets’

FROM Ticket INNER JOIN Actual\_Route

ON Actual\_route.route\_num = Ticket.route\_num INNER JOIN Train

ON Train.Train\_num = Actual\_route.Train\_num

WHERE Train.Type = 'Electric' AND ticket.Type = 'Student';

/\*\*\*\*\*\*\*\*\*\*\*\*Triggers\*\*\*\*\*\*\*/

CREATE TABLE TrainStation\_Log (

old\_name VARCHAR(100),

new\_name VARCHAR(100),

old\_address VARCHAR(100),

new\_address VARCHAR(100),

command\_ts TIMESTAMP,

command VARCHAR(10));

delimiter $

CREATE TRIGGER trainSt\_ins\_trg AFTER INSERT ON Train\_Station

FOR EACH ROW

BEGIN INSERT INTO TrainStation\_Log VALUES(null, new.name, null, new.address, now(), 'insert’);

END$ delimiter ;

delimiter $

CREATE TRIGGER trainSt\_upd\_trg AFTER UPDATE ON Train\_Station

FOR EACH ROW

BEGIN

INSERT INTO TrainStation\_Log VALUES(old.name, new.name, old.address, new.address, now(), 'update’);

END$

delimiter ;

delimiter $

CREATE TRIGGER trainSt\_del\_trg AFTER DELETE ON Train\_Station

FOR EACH ROW

BEGIN INSERT INTO TrainStation\_Log VALUES(old.name, null, old.address, null, now(), 'delete’);

END$

delimiter ;

delimiter $

CREATE TRIGGER add\_ticket AFTER INSERT ON Ticket

FOR EACH ROW

BEGIN

UPDATE actual\_route SET Passengers\_Num =Passengers\_Num+1 WHERE Route\_Num=new.Route\_Num ;

END$