DART Database Design

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DATABASE PROJECT REPORT

A. PROBLEM DESCRIPTION

Dallas Area Road Transport or DART would like one relational database to store the information about their bus transportation system to be able to carry out their work in an organized way. The DART has some major modules such as Bus, Person (Employee and Passenger) and Ticket Sales. A Person can be an Employee or an A-class Passenger. A person can be both an employee and an A-Class passenger. Details of a person such as Person ID, Name (First, Middle, Last), Address, Gender, Date of Birth (Must be 16 years or older), and Phone number (one person can have more than one phone number) are recorded. The Person ID should have the format "PXXX" where X is a number from 0 to 9. The number of children travelling with an A-Class passenger is stored. A maximum of 5 children can travel with an A-Class Passenger. Employee is further classified as Bus Drivers, Staff (Ticket sellers) or Ticket checkers. The start date of the employee is recorded. One bus driver can drive multiple buses and multiple drivers can drive one bus but on different dates. (At a given time in a day, only one driver drives a particular bus). Payment information such as ID, method (cash or card), amount and other information are recorded. Ticket details such as Ticket ID, Bus ID, seat number and price are stored. The staff sells daily tickets to a person and the staff details, ticket details, person details and payment details are stored together. An A-Star passenger is someone who has some extra privileges than an A-Class passenger. An A-Star Passenger can be an Employee or an A-Class passenger or both. Different passes are issued by DART. An A-Class passenger can buy only one pass in a month but an A-Star Passenger can buy multiple passes in a month. Sometimes promotional discounts are offered on the passes and details such promotion ID and promotion description are recorded. The Promotional IDs are not unique and cannot be used to identify a promotion in the system. Each A-Star Passenger is issued a travel card. The travel card details such as card ID, date of issue and other information are stored. A-Star passengers can have guests who travel for free with them four times a month. A Guest log is maintained which stores information such as passenger ID, guest ID, guest SSN, guest name, guest address, and guest contact information. Guest IDs are temporary IDs that a person gets when they travel as a guest of an A-Star passenger. Each guest ID is not unique and cannot be used to identify a guest in the library. Bus details such as Bus Number, License plate number, number of seats and other information are stored. Each route has many bus stops. One bus stop is part of only one route. The route and bus stop details are stored. Each bus is parked in a terminal and the information of the terminal such as Terminal ID, Location, Date and Time are stored. The time table information such as day and start time, end time and intervals (15 min, 20 min, 30 min) are recorded. Values for 'day' can be {M,T,W,Th,F,Sat,Sun}. A unique ID in the form of "DTXX" is given to each unique record in the timetable. For example, Day-{M,W}, StartTime10:00, EndTime – 20:00, Interval - 15m can have ID DT01 and so on. The information of which bus goes by which route and at what time is all stored together. The status of the bus (On Time, Delayed, or Cancelled) is recorded.

B.PROJECT QUESTIONS

1. Is the ability to model superclass/subclass relationships likely to be important in a transportation system environment such as DART? Why or why not?

Yes, In the transportation system environment, there are entity types that have common attributes but also have unique properties that define them.
In other words, they are specialized forms of a more general Entity type.

For ex: Employees and Passengers represent unique roles in the system while also sharing several attributes such as Name, SSN, Age, Gender, DoB, Address etc.
Hence, it's important to model such entity types in a super class sub class relationship.

2. Can you think of 5 more business rules (other than the one explicitly described above) that are likely to be used in a transportation environment? Add your rules to the above requirement to be implemented.

The 5 Business Rules apart from the aforementioned are

1. Employee needs to be given special benefits like discounted pricing, free monthly travel etc.

2. Different types of DART PASSES such as hourly, monthly, annual passes can be issued.

3. Children receive ASTAR membership when they come of age if their parent is an ASTAR PASSENGER.

4. ASTAR PASSENGERS who are members for more than 5 years receive a loyalty bonus, i.e., 5% off every travel.

5. An ASTAR Passenger can refer an ACLASS passenger for ASTAR membership, and both will receive a discount on their next month's travel cost.

3. Justify using a Relational DBMS like Oracle for this project.

In the transportation system environment, there are several important entity types. These entities are related to one another, and in some cases depend on each other's data. For example, A single ticket contains information about both the bus and the person who bought the ticket. Likewise, the transaction to obtain the ticket also contains some of this information. As we can see there is a lot of shared data, which in a non-relational environment would have a lot of data redundancy. Also, since this system is dynamic in nature, data integrity is of very high importance. The usage of a relational DBMS like oracle would allow for relations to be established between the various entity types, thus eliminating the data integrity and redundancy issues.

C.EER DIAGRAM
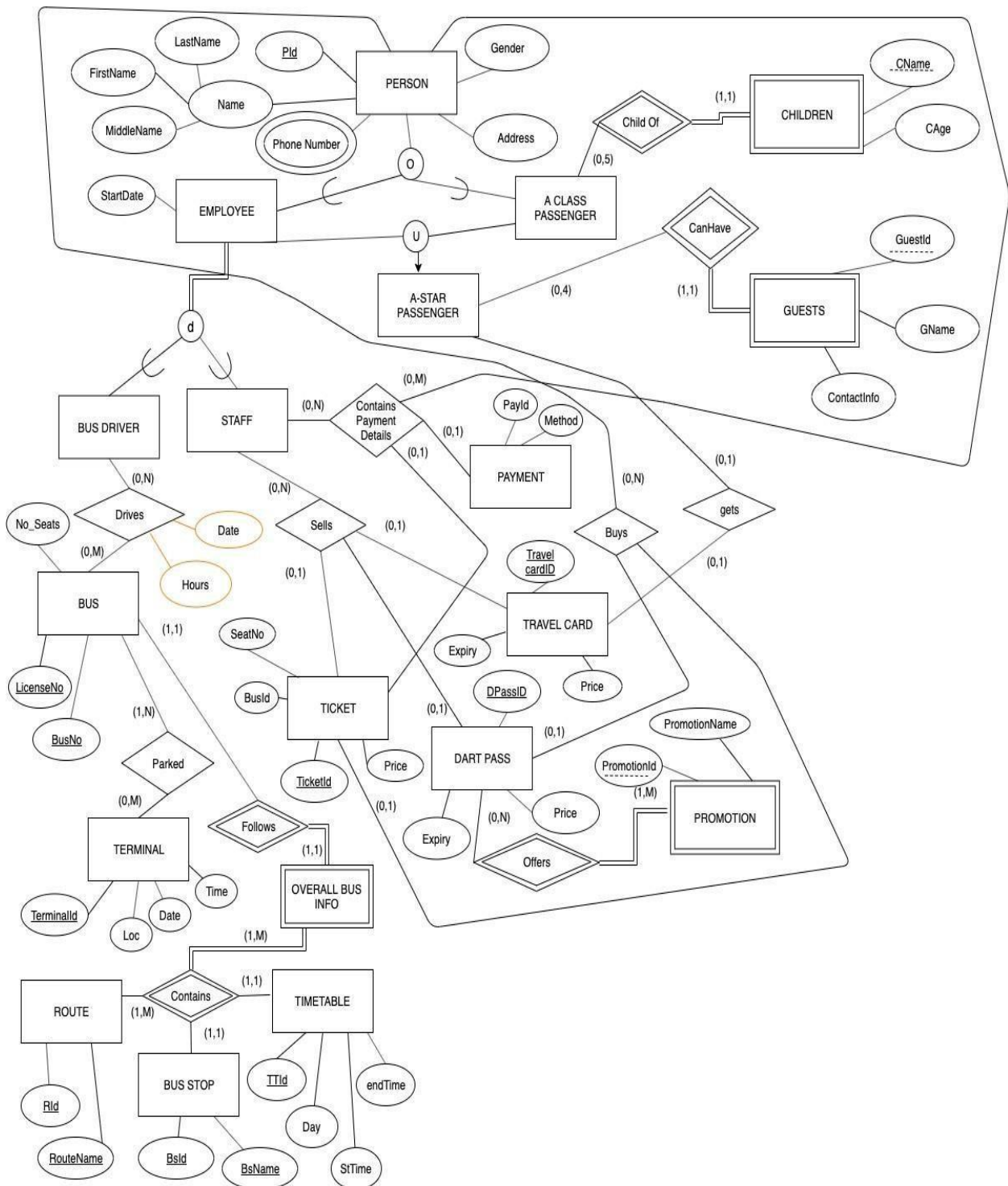
Assumptions:

1.ChildOf:
 Every ACP need not have children.
 Every child belongs to one ACP

2.CanHave Guests:
 Every ASP need no gave guests
 Every guest belongs to one ASP
 3.Drives:
 Every bus driver need not drive(spare drivers)
 Every bus need not be driven(spare buses)

4.Parked:
 A bus has multiple terminals to park
 Terminal can have 0 or multiple buses

5.Contains:
 Route: Each route must be in a Time Table
 Each route must have a bus stop
 Every route has multiple stops
 Every route has multiple records in Time Table
 Bus Stop: Every bus stop is in one route
 Every bus stop has a record in Time Table

6.Follows:
 Every bus must follow Routine
 Every Routine must be part of one bus
 7.Sells:
 Ticket: Every ticket is sold by one staff
 Zero or Multiple tickets are sold by staff

 Travel Card: Zero or multiple cards are sold by staff
 Every travel card is sold by one staff

 Dart Pass: Staff sells zero or multiple Dart passes
 Every dart pass is sold by one staff

8.Promotion:

A dart pass can have one or more promotional offers.

9.Gets (travel card):

Every A-star passenger need not have travel card
Every A-star passenger gets one travel card

Every card not be issued some might be issued later
One issued card belongs to one A-star passenger

10.Contains Payment Details:

Payment: There might not be a payment without a purchase

Every payment must be related to one person, one ticket, one staff.

Person: A person can make zero or multiple payments

No purchase – no payment

Multiple purchase – multiple payments

Staff: No purchases no staff receives payment

Multiple purchases can be handled by multiple staff

Ticket: If there is a purchase of ticket then that has one and only payment associated with it.

11.Person:

Every person is not a A-Class passenger or A-star passenger or Employee of DART. Hence no total participation.

12.Children:

Every child is dependent on A-class passenger to travel in DART

Without A-class Passenger children can't travel in DART, so it is weak entity

13.Guests:

Every guest is dependent on A-star passenger. Hence it is a weak entity.

D.RELATION SCHEMA AFTER NORMALIZATION SATISFYING BCNF & 3NF

BCNF DEFINITION: A relation schema R is in BCNF if for every FD $X \rightarrow Y$ associated with R either – Y   X (i.e., the FD is trivial) or – X is a superkey of R

PERSON

Pid	FirstName	LastName	MiddleName	Address	Gender	DATEOFBIRTH

FD1- Pid   FirstName,LastName, MiddleName, Address, Gender,DATEOFBIRTH.

EMPLOYEE

EPid	StartDate

FD2- EPid StartDate

ACLASSPASSENGER

Apid

FD3- Apid Apid

ASTARPASSENGER

ASEpid	ASApid	MembershipDate

FD4- ASEpid ,ASApid MembershipDate

CHILDREN

CApid	CName	CAge

FD5- CApid ,CName CAge

GUEST

GASEpid	GASAPid	GuestId	GName	ContactInfo	NoOfTravels

FD6- GASEpid ,GASAPid, GuestId GName, ContactInfo

BUSDRIVER BEPid

FD7- BEPid BEPid

STAFF SEPid

FD8- SEPid SEPid

BUS

BusNo	No_Seats	LicenseNo
FD9-	LicenseNo	BusNo ,No_Seats

BusNo	No_Seats	LicenseNo

TERMINAL

Terminalld	Loc	Date	Time

FD10- TerminalId → Loc, Date, Time

DRIVES

DBEPid	Date	Hours	DLicenseNo

FD11- DBEPid ,DLicenseNo → Date, Hours

PARKED

PTerminalld	PLicenseNo

FD12- PTerminalId → PLicenseNoPTerminalId, PLicenseNo **TICKET**

TPid	TicketId	BusId	SeatNo	Price	TSEPid	DateofTravel

FD13- Ticketid → TPid, BusId, SeatNo, Price, TSEPid,DateofTravel

DARTPASS

DPassID	Expiry	Price	DPSEPid	DPPid

FD14- DPassID → Expiry, Price, DPSEPid, DPPid

PAYMENT

PayId	Method	StaffId	PPid

**FD1
4-** PayI
d $\longrightarrow$ Method, StaffId, PPid

TRAVELCARD

TravelCardID	Expiry	Price	StaffId	TCASAPid	TCASEPid	TravelCount	IssueDate

FD15- TravelCardID $\longrightarrow$ Expiry, Price, StaffId, TCASAPid, TCASEPid, TravelCount, IssueDate

PROMOTIONS

PDPassID	**PromotionId**	PromotionName

FD16-
PDPassID $\longrightarrow$ PromotionIdPromotionName **ROUTE**

Rid	RouteName

FD17-Rid   RouteName

BUSSTOP

BsId	BsName

FD18- BsId ⟶ BsName

TIMETABLE

TTId	Day	StTime	endTime	Interval

FD18- TTId   Day, StTime, endTime, Interval

OVERALLBUSINFO

ORid	OBsId	OTTId	OLicenseNo	DateofOperation	Status

FD19- ORid ,OBsId, OTTId ⟶ OLicenseNo , DateofOperation, Status

E.SQL STATEMENTS

TABLE CREATE STATEMENTS

CREATE TABLE "PERSON"

("Pid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
    "FirstName" VARCHAR2(10 BYTE) NOT NULL ENABLE,
    "LastName" VARCHAR2(10 BYTE) NOT NULL ENABLE,
    "MiddleName" VARCHAR2(10 BYTE) NOT NULL ENABLE,
    "Address" VARCHAR2(100 BYTE) NOT NULL ENABLE,
    "Gender" VARCHAR2(7 BYTE) NOT NULL ENABLE,
    "DATEOFBIRTH" DATE NOT NULL ENABLE,
    PRIMARY KEY ("Pid"),
    CONSTRAINT "ID_FORMAT" CHECK (REGEXP_LIKE("Pid",'P[0-9][0-9][0-9]')) ENABLE,
      CONSTRAINT "AGE_CHECK" CHECK ("DATEOFBIRTH"<TO_DATE('01-01-2003','DD-MM-YYYY')) ENABLE,
     CONSTRAINT "GENDERCHECK" CHECK ("Gender" in ('Male','Female','Other')) ENABLE
)

Pid	FirstName	LastName	MiddleName	Addr..	Gender	DATEOFBIRTH
P001	James	Bond	Ruskin	75...	Male	11-00-93
P002	Tim	Robbins	Tommy	75...	Male	10-11-86
P003	Rob	Adams	Michael	65...	Male	11-00-00
P004	Janice	Joplin	Janis	33...	Female	00-00-99
P005	Kenny	Rogers	Sid	60...	Male	11-06-50
P006	Tom	Petry	Alf	ad...	Male	00-11-87
P007	Terry	Lewis	Tyler	ad...	Male	00-11-81
P008	Jeff	Gordon	Emanuel	dd...	Male	14-08-80
P009	Keeran	Keeran	Keerti	ad...	Female	20-07-00
P010	Sidd	Seker	Ganesh	af 22	Male	12-00-97
P011	Dave	Hale	Tom	sa...	Male	20-11-88
P012	Rocky	Boly	Ben	dd...	Male	00-00-00
P013	Dan	Sheffield	North	vs...	Male	11-00-87
P014	Lionel	Messi	Andres	11...	Male	11-00-87
P015	Jimmy	Page	Sujt	ad...	Male	10-00-00
P016	Casey	Affleck	Ben	ad...	Other	10-00-00
P017	Sara	Brightman	Christine	dd...	Female	11-00-87
P018	Wendy	Chu	Xan	aa...	Female	11-00-87
P019	Yasmin	Ameen	Al	33...	Female	01-00-87
P020	Paula	Kate	Mary	ad...	Female	11-00-87

CREATE TABLE "AClassPassenger"

   ("APid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
        PRIMARY KEY ("APid"),
         CONSTRAINT "AClassPassenger_FK1" FOREIGN KEY ("APid")
          REFERENCES "SGC190000"."PERSON" ("Pid")
)

APid
P005
P004
P003
P006
P007
P009
P010
P011
P013
P017
P015
P019
P014
P016
P018
P020

CREATE TABLE "AStarPassenger"

   ("ASAPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,

"ASEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,

"MembershipDate" DATE NOT NULL ENABLE,

CONSTRAINT "AStarPassenger_PK" PRIMARY KEY ("ASAPid", "ASEPid"),

FOREIGN KEY ("ASAPid")REFERENCES "SGC190000"."AClassPassenger" ("APid") ENABLE,
FOREIGN KEY ("ASEPid")REFERENCES "SGC190000"."employee" ("EPid") ENABLE

)

ASAPid	ASEPid	MembershipDate
P003	P003	18-08-15
P004	P004	26-02-19
P016	P016	13-12-10
P007	P007	24-11-18
P010	P010	22-07-18
P014	P014	13-12-10
P018	P018	10-12-10
P020	P020	12-12-10

CREATE TABLE "bus"

("BusNo" NUMBER(*,0) NOT NULL ENABLE,

"No_Seats" NUMBER(*,0) NOT NULL ENABLE,

"LicenseNo" NUMBER(*,0) NOT NULL ENABLE,

PRIMARY KEY ("LicenseNo"),

CONSTRAINT "bus_UK1" UNIQUE ("BusNo")

)

BusNo	No_Seats	LicenseNo
1	70	12345
2	70	23456
3	70	34567
4	70	45678
5	60	56789
6	60	67890
7	80	78901
8	80	89012
9	80	90123
10	70	1234

CREATE TABLE "BusDriver"

("BEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,

PRIMARY KEY ("BEPid"),

FOREIGN KEY ("BEPid")REFERENCES "SGC190000"."employee" ("EPid") ENABLE

)

BEPid
P012
P014
P016
P004
P008
P007
P010

CREATE TABLE "BusStop"

  ("BsId" NUMBER(*,0) NOT NULL ENABLE, "BsName"
        VARCHAR2(20 BYTE) NOT NULL ENABLE, PRIMARY
        KEY ("BsId")

)

BsId	BsName
1	Coit-Campbell
2	Coit-Frankford
3	Coit-McCallum
4	McCallum-Dickerson
5	Renner-Campbell
6	Renner-Cityline
7	Cityline-Bush
8	Coit-Lyndon

CREATE TABLE "Children"

  ("CAPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
      "CName" VARCHAR2(15 BYTE) NOT NULL ENABLE,
      "CAge" NUMBER(*,0) NOT NULL ENABLE,
       CONSTRAINT "CAGE_CHECK" CHECK ("CAge"<18) ENABLE,
      CONSTRAINT "Children_PK" PRIMARY KEY ("CAPid","CName"),
       FOREIGN KEY ("CAPid")
        REFERENCES "SGC190000"."AClassPassenger" ("APid") ENABLE

)

```
create or replace TRIGGER CHILDREN_LIMIT BEFORE INSERT
ON "SGC190000"."Children"
FOR EACH ROW
DECLARE cnt NUMERIC;
BEGIN select count(*) into cnt from
"SGC190000"."Children" where
"CAPid" = :NEW."CAPid"
```

```
group by "CAPid"; IF cnt>4 THEN
raise_application_error(-20001,
    'Error:Children more than 5');
END IF;
END;
```

CAPid	CName	CAge
P017	Babe	11
P017	Timmy	13
P011	Kiddo	11
P011	Childo	12
P013	Papa	14
P013	Motu	11

```
CREATE TABLE "Contains_Payment_Info"

    (    "CPISEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
         "CPIPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
         FOREIGN KEY ("CPISEPid")

          REFERENCES "SGC190000"."staff" ("SEPid") ENABLE,
         FOREIGN KEY ("CPIPid")
          REFERENCES "SGC190000"."PERSON" ("Pid") ENABLE
    )
```

CPISEPid	CPIPid
P001	P010
P001	P011
P003	P014
P003	P011
P001	P003
P001	P005
P003	P001

```
CREATE TABLE "DartPass"

    (    "DPassID" NUMBER(*,0) NOT NULL ENABLE,
         "Expiry" DATE NOT NULL ENABLE,
         "Price" NUMBER(*,0) NOT NULL ENABLE,
         "DPSEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,    "DPPid" VARCHAR2(4 BYTE) NOT NULL

ENABLE,
         PRIMARY KEY ("DPassID"),
         FOREIGN KEY ("DPPid")
          REFERENCES "SGC190000"."PERSON" ("Pid") ENABLE,
```

FOREIGN KEY ("DPSEPid")
         REFERENCES "SGC190000"."staff" ("SEPid") ENABLE)

DPassID	Expiry	Price	DPSEPid	DPPid
1	21-11-19	40	P001	P005
2	21-11-19	40	P001	P002
3	21-11-19	40	P003	P005
4	21-11-19	40	P003	P007
5	21-11-19	40	P003	P010
6	21-11-19	40	P001	P012
7	21-11-19	40	P020	P014
8	21-11-19	40	P020	P004
9	21-11-19	40	P020	P012
10	21-11-19	40	P003	P015

CREATE TABLE "Drives"

("DBEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
        "Date" DATE NOT NULL ENABLE,

        "hours" NUMBER(*,0) NOT NULL ENABLE,
        "DLicenseNo" NUMBER(*,0) NOT NULL ENABLE,
        PRIMARY KEY ("DBEPid", "Date", "DLicenseNo"),
        FOREIGN KEY ("DBEPid")

         REFERENCES "SGC190000"."BusDriver" ("BEPid")
         ENABLE, FOREIGN KEY ("DLicenseNo")
         REFERENCES "SGC190000"."bus" ("LicenseNo") ENABLE

)

DBEPid	Date	hours	DLicenseNo
P012	24-11-19	5	12345
P012	23-11-19	4	12345
P012	22-11-19	5	12345
P012	21-11-19	7	12345
P012	20-11-19	6	12345
P012	19-11-19	8	12345
P012	18-11-19	6	12345
P012	06-11-19	5	23456
P014	13-11-19	4	23456
P016	15-11-19	5	34567
P004	09-11-19	6	45678
P008	26-11-19	3	56789
P007	08-11-19	5	67890
P010	03-11-19	4	67890

CREATE TABLE "employee"
("EPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
        "StartDate" DATE NOT NULL ENABLE,

```
        PRIMARY KEY ("EPid"),

        CONSTRAINT "employee_FK1" FOREIGN KEY ("EPid")
         REFERENCES "SGC190000"."PERSON" ("Pid") ENABLE
    )
```

EPid	StartDate
P001	18-11-15
P002	09-10-14
P003	13-11-10
P004	11-07-17
P008	17-07-19
P007	19-11-19
P010	05-08-19
P012	13-11-10
P014	13-11-10
P016	13-11-10
P018	13-11-10
P020	13-11-10

```
CREATE TABLE "Guest"
   (        "GASEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,

        "GASAPid" VARCHAR2(4 BYTE) NOT NULL ENABLE, "GuestId" VARCHAR2(4 BYTE) NOT
NULL ENABLE, "GName" VARCHAR2(15 BYTE) NOT
NULL ENABLE,

        "ContactInfo" VARCHAR2(50 BYTE) NOT NULL ENABLE,
        "GUESTSSN" NUMBER NOT NULL ENABLE, "ADDRESS"
        VARCHAR2(50 BYTE) NOT NULL ENABLE,
        "NOOFTRAVELS" NUMBER NOT NULL ENABLE,

        CONSTRAINT "Guest_PK" PRIMARY KEY ("GASEPid", "GASAPid", "GUESTSSN"),
        CONSTRAINT "TRAVEL_LIMIT" CHECK ("NOOFTRAVELS"<=4) ENABLE,
        FOREIGN KEY ("GASAPid", "GASEPid")
         REFERENCES "SGC190000"."AStarPassenger" ("ASAPid", "ASEPid") ENABLE
    )
```

GASEPid	GASAPid	GuestId	GName	ContactInfo	GUESTSSN	ADDRESS	NOOFTRAVE..
P018	P018	123	tom	dsfgsdfgasdfg	123	sdfgsdfg	3
P018	P018	123	bill	asdfgasdfga	234	sdfgsdfger	2
P016	P016	144	jeff	asdfgasdf	345	sergvsre	4
P016	P016	144	james	asdfgasdf	456	stujtdyh	2
P020	P020	155	carter	asdasdfar	567	srhtwhw	3
P020	P020	155	lenny	aertegr4	678	sfhterhe6	1

CREATE TABLE "OverallBusInfo"

```
(       "ORId" NUMBER(*,0) NOT NULL ENABLE, "OBsId"
        NUMBER(*,0) NOT NULL ENABLE, "OTTId" VARCHAR2(4
        BYTE) NOT NULL ENABLE, "Status" VARCHAR2(10 BYTE)
        NOT NULL ENABLE, "OLicenseNo" NUMBER(*,0) NOT
        NULL ENABLE, "DateOfOperation" DATE NOT NULL
        ENABLE, "TimeArrived" VARCHAR2(5 BYTE) NOT NULL
        ENABLE,
         CONSTRAINT "STATUS" CHECK ("Status" in ('Delayed','On-Time','Cancelled')) ENABLE,
        FOREIGN KEY ("OBsId")
         REFERENCES "SGC190000"."BusStop" ("BsId") ENABLE,
        UNIQUE("OBsId"),
         FOREIGN KEY ("ORId")
         REFERENCES "SGC190000"."route" ("Rid") ENABLE,
        FOREIGN KEY ("OTTId")
         REFERENCES "SGC190000"."TimeTable" ("TTId") ENABLE,
        FOREIGN KEY ("OLicenseNo")
         REFERENCES "SGC190000"."bus" ("LicenseNo") ENABLE
)
```

ORId	OBsId	OTTId	Status	OLicenseNo	DateOfOperation	TimeArrived
1	1	DT01	Delayed	12345	19-09-19	13:25
1	2	DT02	On-Time	12345	29-10-19	13:30
2	3	DT02	Cancelled	34567	11-11-19	13:00
2	4	DT03	Cancelled	34567	20-11-19	14:00
3	1	DT05	Delayed	67890	17-11-19	14:22
5	5	DT06	On-Time	56789	20-11-19	14:00
5	6	DT06	On-Time	56789	20-11-19	14:00
3	3	DT05	On-Time	12345	20-11-19	14:00
5	8	DT07	On-Time	56789	20-11-19	14:00
5	7	DT06	On-Time	56789	20-11-19	14:00
7	6	DT03	On-Time	23456	20-11-19	14:00
8	8	DT04	On-Time	45678	20-11-19	14:00
2	4	DT03	Cancelled	34567	21-11-19	14:00

CREATE TABLE "Parked"

```
(        "PTerminalId" NUMBER(*,0) NOT NULL ENABLE,
        "PLicenseNo" NUMBER(*,0) NOT NULL ENABLE,
         FOREIGN KEY ("PTerminalId")
          REFERENCES "SGC190000"."terminal" ("TerminalId") ENABLE,
         FOREIGN KEY ("PLicenseNo")
          REFERENCES "SGC190000"."bus" ("LicenseNo") ENABLE

  )
```

PTerminalId	PLicenseNo
1	12345
1	23456
2	23456
2	34567
3	34567
3	45678
6	45678
6	56789
7	56789
7	12345

```
CREATE TABLE "Payment"
  (        "PayId" NUMBER(*,0) NOT NULL ENABLE,
          "Method" VARCHAR2(10 BYTE) NOT NULL ENABLE,
          "Date" DATE NOT NULL ENABLE,
          "PPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
          "StaffId" VARCHAR2(4 BYTE) NOT NULL ENABLE,
           PRIMARY KEY ("PayId"),
           FOREIGN KEY ("PPid")
            REFERENCES "PERSON" ("Pid") ENABLE,
           FOREIGN KEY ("StaffId")
            REFERENCES "SGC190000"."staff" ("SEPid") ENABLE
  )
```

PayId	Method	Date	PPid	StaffId
1	Cash	13-11-19	P004	P001
2	Cash	13-11-19	P004	P001
3	Card	13-11-19	P005	P001
8	Card	13-11-19	P005	P003
9	Cash	13-11-19	P005	P003
10	Cash	13-11-19	P010	P003
4	Card	13-11-19	P010	P003
5	Card	13-11-19	P012	P003
6	Card	13-11-19	P012	P020
7	Card	13-11-19	P015	P020

CREATE TABLE "person_phonenumber"
   ("Phone_Pid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
         "PhoneNumber" VARCHAR2(20 BYTE) NOT NULL ENABLE,
          PRIMARY KEY ("PhoneNumber"),
          CONSTRAINT "NUMBERMATCH"   CHECK   (Regexp_like("PhoneNumber",'[0-9]{10}'))
ENABLE,
         FOREIGN KEY ("Phone_Pid")
          REFERENCES "SGC190000"."PERSON" ("Pid") ENABLE
)

Phone_Pid	PhoneNumber
P005	2483293033
P003	2481234565
P003	4564343432

CREATE TABLE "Promotions"
   ("PDPassID" NUMBER(*,0) NOT NULL ENABLE,
         "PromotionId" NUMBER(*,0) NOT NULL ENABLE,
         "PromotionName" VARCHAR2(15 BYTE) NOT NULL ENABLE,
         PRIMARY KEY ("PromotionId","PDPassID"),
          FOREIGN KEY ("PDPassID")
           REFERENCES "SGC190000"."DartPass" ("DPassID") ENABLE
)

PDPassID	PromotionId	PromotionName
1	1	Free
1	2	Free
1	3	Free
2	4	25% off
3	5	50% off
3	6	25% off

CREATE TABLE "route"

  ("Rid" NUMBER(*,0) NOT NULL ENABLE,

       "RouteName" VARCHAR2(20 BYTE) NOT NULL ENABLE,

        PRIMARY KEY ("Rid")

)

Rid	RouteName
1	McCallum-Meandering
2	McCallum-Frankford
3	George Bush East
4	McCallum-Neverland
5	Frankford-Atlantis
6	Atlantis-Chatham
7	Plano-Frankford
8	UTD-Plano

CREATE TABLE "staff"

  ("SEPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,

       PRIMARY KEY ("SEPid"),

        FOREIGN KEY ("SEPid")

         REFERENCES "SGC190000"."employee" ("EPid") ENABLE

)

...
P001
P003
P018
P002
P020

CREATE TABLE "terminal"

  ("TerminalId" NUMBER(*,0) NOT NULL ENABLE,

```
        "Loc" VARCHAR2(30 BYTE) NOT NULL ENABLE,
        "Date" DATE NOT NULL ENABLE,
        "Time" VARCHAR2(5 BYTE) NOT NULL ENABLE,
         PRIMARY KEY ("TerminalId")
    )
```

Termi...	Loc	Date	Time
1	WestHam	19-11-19	10:00
2	Tottenham	19-11-19	10:00
3	Chelsea	19-11-19	10:00
4	Burnley	19-11-19	10:00
5	Liverpool	19-11-19	10:00
6	Manchester	19-11-19	10:00
7	Cardiff	19-11-19	10:00
8	Sheffield	19-11-19	10:00

```
CREATE TABLE "ticket"
   (      "TPid" VARCHAR2(4 BYTE) NOT NULL ENABLE,
          "TicketId" NUMBER(*,0) NOT NULL ENABLE,
          "BusId" NUMBER(*,0) NOT NULL ENABLE,
          "SeatNo" NUMBER(*,0) NOT NULL ENABLE,
          "Price" FLOAT(126) NOT NULL ENABLE, "TSEPid"
          VARCHAR2(4 BYTE) NOT NULL ENABLE,
          "DATEOFTRAVEL" DATE NOT NULL ENABLE,
          PRIMARY KEY ("TicketId"),
           FOREIGN KEY ("TPid")

           REFERENCES "SGC190000"."PERSON" ("Pid")
          ENABLE, FOREIGN KEY ("BusId")

           REFERENCES "SGC190000"."bus" ("BusNo")
          ENABLE, FOREIGN KEY ("TSEPid")
           REFERENCES "SGC190000"."staff" ("SEPid") ENABLE
    )
```

TPid	TicketId	BusId	SeatNo	Price	TSEPid	DATEOFTRAVEL
P001	1	2	23	5.99	P003	24-12-18
P002	2	1	34	5.99	P001	24-01-19
P002	3	2	54	5.99	P001	21-10-17
P002	4	1	23	5.99	P003	11-01-19
P003	5	2	22	5.99	P001	21-10-19
P003	6	2	11	5.99	P001	26-10-19
P001	7	1	12	5.99	P003	24-10-19
P005	8	1	13	5.99	P003	24-09-19
P005	9	4	14	6.99	P001	19-08-19
P004	10	4	23	5.99	P003	14-01-19
P005	11	4	14	6.99	P001	24-09-19
P005	12	4	14	6.99	P001	19-10-19
P005	13	4	14	6.99	P001	19-11-19
P005	14	4	14	6.99	P001	25-09-19
P005	15	4	14	6.99	P001	19-11-19
P005	16	4	14	6.99	P001	19-10-19
P005	17	4	14	6.99	P001	19-10-19
P005	18	4	14	6.99	P001	19-10-19
P005	20	4	14	6.99	P001	19-11-19
P005	21	4	14	6.99	P001	19-11-19
P005	22	4	14	6.99	P001	19-11-19
P005	23	4	14	6.99	P001	19-11-19
P005	24	4	14	6.99	P001	19-11-19
P005	25	4	14	6.99	P001	19-11-19
P005	26	4	14	6.99	P001	19-11-19
P005	27	4	14	6.99	P001	19-11-19
P005	28	4	14	6.99	P001	19-11-19
P005	29	4	14	6.99	P001	19-11-19
P005	30	4	14	6.99	P001	19-11-19
P005	31	4	14	6.99	P001	19-11-19
P005	32	4	14	6.99	P001	19-11-19

CREATE TABLE "TimeTable"

("TTId" VARCHAR2(4 BYTE) NOT NULL ENABLE,
    "Day" VARCHAR2(20 BYTE) NOT NULL ENABLE,
    "StTime" VARCHAR2(5 BYTE) NOT NULL ENABLE,   "endTime" VARCHAR2(5 BYTE) NOT

NULL ENABLE, "INTERVAL" NUMBER NOT NULL
ENABLE,

```
    PRIMARY KEY ("TTId"),
    CONSTRAINT "TTID_FORMAT" CHECK (Regexp_like("TTId",'DT[0-9][0-9]')) ENABLE,
    CONSTRAINT "INTERVAL_CHECK" CHECK ("INTERVAL" in (15,20,30)) ENABLE,
    CONSTRAINT                          "DAYS"                          CHECK
(Regexp_like("Day",'(M|W|T|Th|F|Sat|Sun)(,(M|T|W|Th|F|Sat|Sun))*')) ENABLE
  )
```

TTId	Day	StTime	endTime	INTERVAL
DT01	M,W	07:00	22:00	15
DT02	W,Th	07:00	22:00	15
DT03	T,Th	09:00	23:00	20
DT04	Sat,Sun	09:00	23:00	20
DT05	M,W,T	07:00	23:00	30
DT06	F,Sat,Sun	07:00	21:00	15
DT07	Sun	10:00	18:00	20
DT08	M,T,W,Th,F	10:00	20:00	30

```
CREATE TABLE "travelcard"

  (    "TravelCardID" NUMBER(*,0) NOT NULL ENABLE,
       "Expiry" DATE NOT NULL ENABLE, "IssueDate"
       DATE NOT NULL ENABLE,

       "Price" FLOAT(126) NOT NULL ENABLE, "StaffId"
       VARCHAR2(4 BYTE) NOT NULL ENABLE, "TCASAPid"
       VARCHAR2(4 BYTE) NOT NULL ENABLE, "TCASEPid"
       VARCHAR2(4 BYTE) NOT NULL ENABLE,
       "TravelCount" NUMBER(*,0) NOT NULL ENABLE,
       PRIMARY KEY ("TravelCardID"), FOREIGN KEY
       ("StaffId")
        REFERENCES "SGC190000"."staff" ("SEPid") ENABLE,
       FOREIGN KEY ("TCASAPid", "TCASEPid")
        REFERENCES "SGC190000"."AStarPassenger" ("ASAPid", "ASEPid") ENABLE
  )
```

TravelCardID	Expiry	IssueDate	Price	StaffId	TCASAPid	TCASEPid	TravelCount
1	24-11-18	24-10-18	10	P001	P003	P003	30
2	24-11-18	24-10-18	10	P001	P004	P004	70
3	03-12-17	03-11-17	10	P003	P007	P007	80
4	19-08-15	19-07-15	10	P003	P010	P010	30
5	11-09-19	11-08-19	8	P001	P003	P003	30
6	11-06-19	11-05-19	8	P001	P003	P003	30
7	07-08-19	07-07-19	9	P001	P007	P007	10
8	26-04-19	26-03-19	9	P003	P007	P007	40
9	19-08-15	19-07-15	9	P020	P016	P016	30
10	19-08-15	19-07-15	9	P020	P018	P018	10
11	19-08-15	19-07-15	9	P020	P016	P016	40
12	19-08-15	19-07-15	9	P001	P018	P018	30
13	19-08-15	19-07-15	9	P001	P016	P016	10
14	19-08-15	19-07-15	9	P003	P018	P018	40
15	19-08-15	19-07-15	9	P003	P016	P016	30
16	19-08-15	19-07-15	9	P003	P018	P018	10
17	19-08-15	19-07-15	9	P001	P016	P016	40
18	19-08-15	19-07-15	9	P001	P018	P018	30
19	19-08-15	19-07-15	9	P001	P016	P016	10
20	19-08-15	19-07-15	9	P020	P018	P018	40

VIEWS

1. CREATE VIEW "TopA-StarPassenger" AS (SELECT "FirstName","LastName","MembershipDate" from "PERSON","AStarPassenger" where "PERSON"."Pid" = "AStarPassenger"."ASAPid" and "AStarPassenger"."ASAPid" in (SELECT "TCASAPid" from "travelcard" WHERE "Expiry">to_date('23-NOV-2018','DD-MON-YYYY') Group by "TCASAPid" HAVING SUM("TravelCount")>=60));

	FirstName	LastName	MembershipDate
1	Janice	Joplin	26-02-19
2	Rob	Adams	18-08-15

2. CREATE VIEW "PopularBus" AS
(SELECT "BusNo", "LicenseNo","No_Seats" from "bus" where "BusNo"

IN

(SELECT "BusId" from "ticket" WHERE "DATEOFTRAVEL">to_date('23-NOV-2017','DD-MON-YYYY')

GROUP BY "BusId"

ORDER BY COUNT(*) DESC

FETCH FIRST 1 ROWS ONLY));

	BusNo	LicenseNo	No_Seats
1	4	45678	70

3. CREATE VIEW "TopDelayedCancelledBus" as
   (SELECT "BusNo","LicenseNo","No_Seats" from "bus" where "LicenseNo" in

   (SELECT "OLicenseNo" from "OverallBusInfo" where ("Status"='Delayed' or
   "Status"='Cancelled') and
   "OverallBusInfo"."DateOfOperation">TO_DATE('23-OCT-2019','DD-MON-YYYY')
   GROUP BY "OLicenseNo"
   ORDER BY COUNT(*) DESC
   FETCH FIRST 1 ROWS ONLY));

	BusNo	LicenseNo	No_Seats
1	3	34567	70

4. CREATE VIEW "PotentialAStarPassenger" AS
   (Select   ,"Pid","FirstName","LastName","PhoneNumber"   from
   "PERSON","person_phonenumber"   where

   "PERSON"."Pid"="person_phonenumber"."Phone_Pid" and "PERSON"."Pid" in
   (Select "APid" from "AClassPassenger" where "APid" in

   (SELECT "TPid" from "ticket" where "DATEOFTRAVEL">TO_DATE('23-
   SEP-2019','DDMONYYYY') GROUP BY "TPid" HAving COUNT(*)>=40)));

	FirstName	LastName	PhoneNumber
1	Kenny	Rogers	2483293033

5. CREATE VIEW "TopEmployee" AS
   (SELECT "Pid","FirstName","LastName" from "PERSON" where "Pid" in
   (SELECT "TPid" from "ticket","employee" where "TPid"="EPid" and

   "DATEOFTRAVEL">TO_DATE('23-OCT-2019','DD-MON-YYYY') GROUP BY "TPid" ORDER BY
   COUNT(*) DESC FETCH FIRST 1 ROWS ONLY));

	Pid	FirstName	LastName
1	P001	James	Bond

SQL Queries

1. Select "Pid","FirstName","LastName" from PERSON where "Pid" in (select * from "staff");

	Pid	FirstName	LastName
1	P001	James	Bond
2	P002	Tim	Robbins
3	P003	Rob	Adams
4	P018	Wendy	Cho
5	P020	Paula	Kate

2. Select "Pid","FirstName","LastName" from "PERSON","AClassPassenger","employee" where "APid"="Pid" and "APid"="EPid";

	Pid	FirstName	LastName
1	P003	Rob	Adams
2	P004	Janice	Joplin
3	P007	Jerry	Lewis
4	P010	Sidd	Sekar
5	P014	Lionel	Messi
6	P016	Casey	Affleck
7	P018	Wendy	Cho
8	P020	Paula	Kate

3. SELECT AVG(TC) from (SELECT SUM("TravelCount") TC from "travelcard" where "Expiry">=TO_DATE('23-NOV-2018','DD-MON-YYYY') GROUP BY "TCASAPid" having sum("TravelCount")>=60 order by sum("TravelCount") DESC FETCH FIRST 5 ROWS ONLY);

	AVG(TC)
1	80

4. SELECT "BusNo","RouteName" from "OverallBusInfo","route","PopularBus" where "PopularBus"."LicenseNo" = "OverallBusInfo"."OLicenseNo" and

"OverallBusInfo"."ORId" = "route"."Rid";

	BusNo	RouteName
1	4	UTD-Plano

5. SELECT "OLicenseNo"from "bus","OverallBusInfo" where "DateOfOperation">=TO_DATE('23-10-2019','DD-MM-YYYY') and

"Status"='Cancelled' GROUP BY "OLicenseNo"
HAVING COUNT("OLicenseNo")>3;

	OLicen..
1	34567

6. Select "BusId",COUNT(*) as count from "ticket" Group By "BusId";

	BusId	COUNT
1	1	4
2	2	4
3	4	42

7. SELECT "DBEPid" from "Drives" where "Date">TO_DATE('16-11-2019','DD-MM-YYYY') group by "DBEPid" having COUNT(*)=7;

	DBEPid
1	P012

8. SELECT COUNT(DISTINCT t."TPid") as "PopularPeople" from "ticket" t, "PopularBus" p where p."BusNo"=t."BusId";

	PopularPeople
1	2

9. SELECT "TPid","TicketId","BusId","SeatNo","Price" from "ticket" where "DateOfTravel" > (Select "StartDate" from "employee" order by "StartDate" DESC FETCH FIRST 1 ROWS ONLY);

	TPid	TicketId	BusId	SeatNo	Price
1	P007	52	4	14	6.99

10. SELECT DISTINCT   "ASEPid"   from   "employee","AStarPassenger" where

"MembershipDate">="employee"."StartDate"   and

"MembershipDate"<="employee"."StartDate"+30;

	ASEPid
1	P016
2	P020
3	P014
4	P018

11. SELECT "ORId" from "OverallBusInfo" Group by "ORId" order by COUNT(*) DESC FETCH FIRST 1 ROWS ONLY;

	ORId
1	5

12. SELECT "Pid","FirstName","LastName" from "PERSON" where "Pid" in
        (SELECT   "ASAPid"   from   "AStarPassenger"   where

"AStarPassenger"."MembershipDate"<=TO_DATE('23-11-2014','DD-MM-YYYY')
);

	Pid	FirstName	LastName
1	P014	Lionel	Messi
2	P016	Casey	Affleck
3	P018	Wendy	Cho
4	P020	Paula	Kate

13. Select "Pid","TicketId","BusId","Price","SeatNo" from "PotentialAStarPassenger","ticket"
    where
        "DATEOFTRAVEL">=TO_DATE('27-11-2018','DD-MM-YYYY')   and

"PotentialAStarPassenger"."Pid"="TPid";

	Pid	TicketId	BusId	Price	SeatNo
1	P005	51	4	6.99	14
2	P005	50	4	6.99	14
3	P005	49	4	6.99	14
4	P005	48	4	6.99	14
5	P005	47	4	6.99	14
6	P005	46	4	6.99	14
7	P005	45	4	6.99	14
8	P005	44	4	6.99	14
9	P005	43	4	6.99	14
10	P005	42	4	6.99	14
11	P005	41	4	6.99	14
12	P005	40	4	6.99	14
13	P005	39	4	6.99	14
14	P005	38	4	6.99	14
15	P005	37	4	6.99	14
16	P005	36	4	6.99	14
17	P005	35	4	6.99	14
18	P005	34	4	6.99	14
19	P005	33	4	6.99	14
20	P005	32	4	6.99	14
21	P005	31	4	6.99	14
22	P005	30	4	6.99	14

F.DEPENDENCY DIAGRAM

PERSON

Pid	FirstName	LastName	MiddleName	Address	Gender	DateofBirth

EMPLOYEE

EPid	StartDate

ACLASSPASSENGER

Apid

ASTARPASSENGER
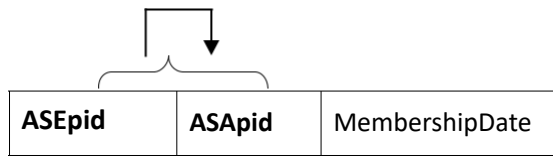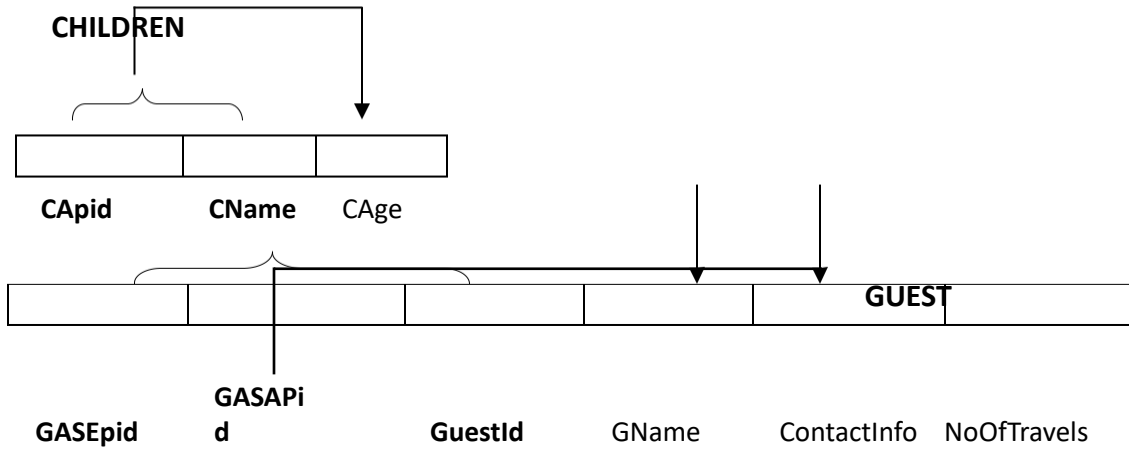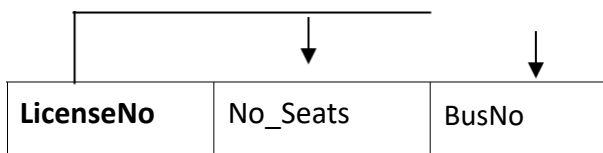
ASEpid	ASApid	MembershipDate

CHILDREN

CApid	**CName**	CAge

GUEST

GASEpid	**GASAPid**	**GuestId**	GName	ContactInfo NoOfTravels

BUSDRIVER

BEPid

STAFF

SEPid

BUS

LicenseNo	No_Seats	BusNo

TERMINAL

TerminalId	Loc	Date	Time

DRIVES

~~DBEPid~~	~~DLicenseNo~~	Hours	Date

PARKED

PTerminalId	PLicenseNo

TICKET

TicketId	TPid	BusId	SeatNo	Price	TSEPid	DateofTravel

DARTPASS

DPassID	Expiry	Price	DPSEPid	DPPid

PAYMENT

PayId	Method	StaffId	PPid

TRAVELCARD

TravelCardID	Expiry	Price	StaffId	TCASAPid	TCASEPid	IssueDate	TravelCount

PROMOTIONS

PDPassID	PromotionId	PromotionName
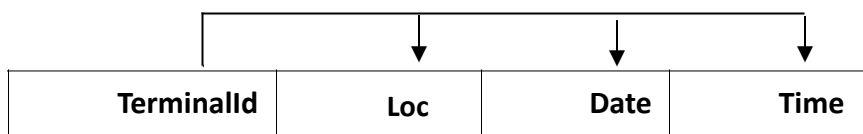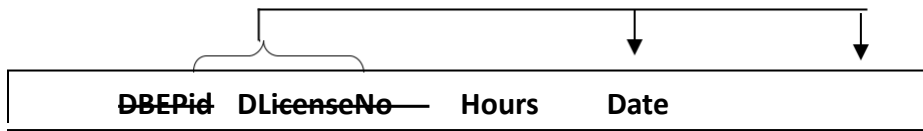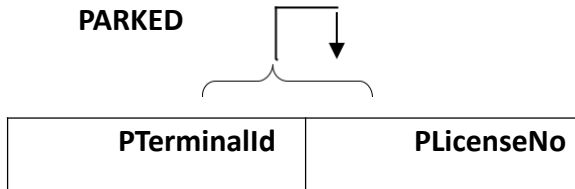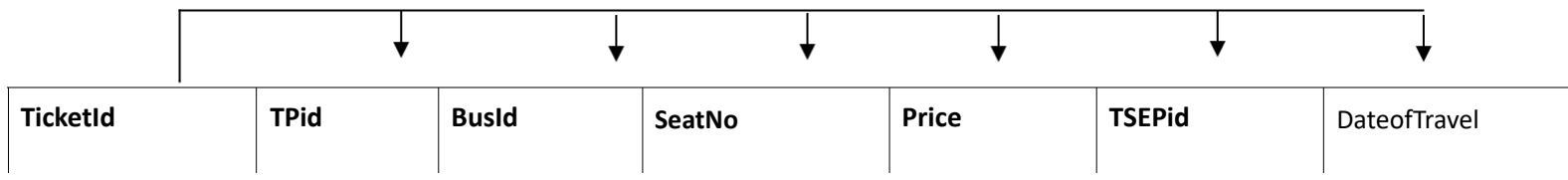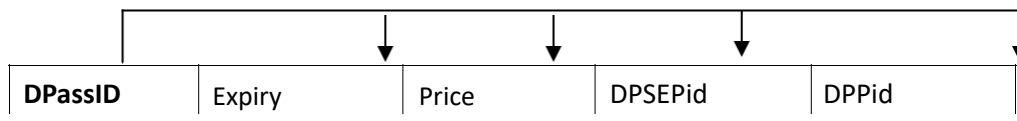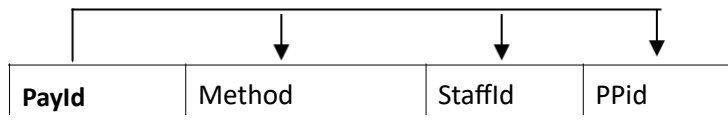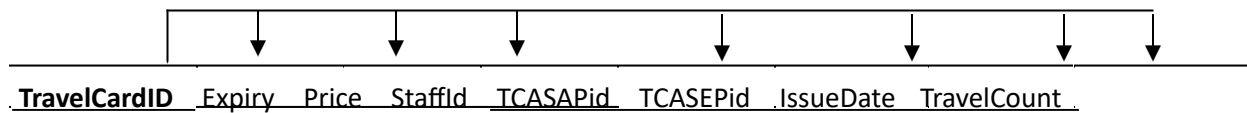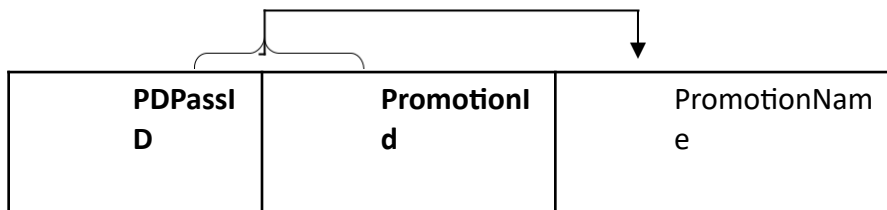
ROUTE

Rid

RouteName

BUSSTOP

BsId	BsName

TIMETABLE

TTId	Day	StTime	endTime	Interval

OVERALLBUSINFO

ORid	OBsId	OTTId	OLicenseNo	DateofOperation	Status