DBMS ASSIGNMENT - 5

Roll Number: U19CS012

Name: BHAGYA VINOD RANA

In reference to the **Railway database** given below, attempt the following questions:
The queries to create the tables and the data to be inserted are listed below. Run these queries against the database to have your tables and data ready.
SQL-Code [SQLite 3.29.0**]:**

```
BEGIN TRANSACTION;

create table train(
    id varchar(5) ,
    name varchar(20),
    primary key (id)
);

create table station(
    stcode varchar(5),
    name varchar(20),
    primary key (stcode)
);

create table track(
    stcode1 varchar(5) ,
    stcode2 varchar(5),
    distance integer ,
    primary key (stcode1, stcode2)
);

create table trainhalts(
    id varchar(5) ,
    seqno integer ,
    stcode varchar(10),
    timein varchar(5) ,
    timeout varchar(5) ,
    primary key (id, seqno)
);

insert into train values ('KP11' ,'CST-KYN');
insert into train values ('KP11L' ,'CST-KYN_LOCAL');
insert into train values ('T129' ,'CST-TNA_LOCAL');
insert into train values ('A63' ,'CST-DL_LOCAL');
insert into train values ('K101' ,'CST-KYN_LOCAL');
insert into train values ('N27' ,'CST-TNA_LOCAL');
insert into train values ('S33' ,'CST-KGR_LOCAL');
insert into train values ('A65' ,'CST-AMR_LOCAL');
```

```sql
insert into station values ('CST' ,'MUMBAI');
insert into station values ('BYC' ,'BYCULLA');
insert into station values ('DR' ,'DADAR');
insert into station values ('KRL' ,'KURLA');
insert into station values ('GPR' ,'GHATKOPAR');
insert into station values ('TNA' ,'THANE');
insert into station values ('DL' ,'DOMBIVALI');
insert into station values ('AMR' , 'AMBARNATH');
insert into station values ('KYN' ,'KALYAN');
insert into station values ('KSR' ,'KASARA');

insert into track values ('CST' ,'BYC', 5);
insert into track values ('CST' ,'DR', 9);
insert into track values ('CST' ,'KRL', 16);
insert into track values ('CST' ,'GPR', 20);
insert into track values ('CST' ,'TNA', 34);
insert into track values ('CST' ,'DL', 49);
insert into track values ('CST' ,'KYN', 54);
insert into track values ('CST' ,'KSR', 77);
insert into track values ('CST' ,'AMR', 65);
insert into track values ('BYC' ,'DR', 4);
insert into track values ('BYC' ,'KRL', 11);
insert into track values ('GRP' ,'TNA', 14);
insert into track values ('DR' ,'TNA', 25);
insert into track values ('KRL' ,'KYN', 38);
insert into track values ('TNA' ,'KYN', 20);
insert into track values ('TNA' ,'KSR', 43);

insert into trainhalts values ('KP11' , 0 , 'CST' , NULL, '20.23');
insert into trainhalts values ('KP11' , 1 , 'BYC' , '20.31', '20.32');
insert into trainhalts values ('KP11' , 2 , 'DR' , '20.41', '20.42');
insert into trainhalts values ('KP11' , 3 , 'GPR' , '20.52', '20.53');
insert into trainhalts values ('KP11' , 4 , 'GPR' , '20.52', '20.53');
insert into trainhalts values ('KP11' , 5 , 'DR' , '20.41', '20.42');
insert into trainhalts values ('KP11' , 6 , 'GPR' , '20.58', '20.59');
insert into trainhalts values ('KP11' , 7 , 'TNA' , '21.21', '21.22');
insert into trainhalts values ('KP11' , 8 , 'DL' , '21.45', '21.46');
insert into trainhalts values ('KP11' , 9 , 'KYN' , '21.54', NULL);
insert into trainhalts values ('A65' , 0 , 'CST' , NULL , '20.52');
insert into trainhalts values ('A65' , 1 , 'BYC' , '21.00' , '21.01');
insert into trainhalts values ('A65' , 2 , 'DR' , '21.10' , '21.11');
insert into trainhalts values ('A65' , 3 , 'KRL' , '21.22' , '21.23');
insert into trainhalts values ('A65' , 4 , 'GPR' , '21.28' , '21.29');
insert into trainhalts values ('A65' , 5 , 'TNA' , '21.49' , '21.50');
insert into trainhalts values ('A65' , 6 , 'DL' , '22.13' , '22.14');
insert into trainhalts values ('A65' , 7 , 'KYN' , '22.22' , '22.23');
insert into trainhalts values ('A65' , 8 , 'AMR' , '22.36' , NULL);

-- Saving the Work
```

```
COMMIT;

-----------------------------------------------------------------

-- For Output Formatting [Human Understandable Form] in SQLite

.mode column
.headers on
.separator ROW "\n"
.nullvalue NULL

-----------------------------------------------------------------
-
- 1. Display all the pairs of stations with total distance for given source and destinations.

SELECT s1.name AS "START-POINT",s2.name AS "END-POINT", t.distance AS "DISTANCE"
FROM station s1,station s2, track t
WHERE s1.stcode==t.stcode1 AND s2.stcode==t.stcode2;

-
- 2. Find the pairs of stations (station codes) which have a track with distance less than 20
Kms
-- between them.

SELECT s1.name AS "START-POINT",s2.name AS "END-POINT", t.distance AS "DISTANCE"
FROM station s1,station s2, track t
WHERE s1.stcode==t.stcode1 AND s2.stcode==t.stcode2 AND t.distance<20;

-- 3. Find the IDs of all the trains which have a stop at GHATKOPAR

SELECT DISTINCT t1.id AS "TRAIN-NO", t1.name AS "TRAIN-NAME"
FROM trainhalts th1,train t1
WHERE (th1.stcode=='GPR' AND th1.id==t1.id);

-- 4. Find the ordered list of names of all trains that start at MUMBAI.

SELECT s.name AS "TRAINS_STARTING_AT_MUMBAI"
FROM track t,station s
WHERE t.stcode1=='CST' AND t.stcode2==s.stcode ORDER BY s.name;

-- 5. List all the stations in order of visit by the train 'CST-AMR_LOCAL'.

SELECT s.name AS "STATIONS VISITED BY TRAIN 'CST-AMR_LOCAL'"
FROM trainhalts th, station s, train t
WHERE (t.name == 'CST-AMR_LOCAL' AND t.id == th.id AND th.stcode == s.stcode)

-
- 6. Find the name of the trains which stop at Thane, before the 6th stop in the route of the
 train.
```

```sql
SELECT t.name AS "TRAINS STOPS AT THANE [BEFORE 6TH STOP IN ROUTE]"
FROM trainhalts th, train t
WHERE (th.seqno<6 AND th.id==t.id AND th.stcode == 'TNA');

-- 7. Display the pair of stations (i.e. station names) having maximum distance between them.

SELECT s1.name AS "MAX DISTANCE STATION_1 [START]",s2.name AS "MAX DISTANCE STATION_2 [END]"
FROM track t,station s1,station s2
WHERE (t.distance = (SELECT MAX(distance) FROM track)) AND (t.stcode1==s1.stcode) AND (t.stco
de2==s2.stcode);

-- 8. Display id of the trainhalt having second highest time out.

SELECT id AS "TRAIN-HALT ID WITH 2ND HIGHEST TIMEOUT",timeout FROM trainhalts
WHERE timeout = (
SELECT MAX(timeout)
FROM trainhalts
WHERE timeout NOT IN (SELECT MAX(timeout) FROM trainhalts));

-
- 9. Remove Track “CST” from the track table. Note: If any track is removed from the track ta
ble,
-- then that track related information also should be removed from the other tables.

DELETE FROM station WHERE stcode = 'CST';
DELETE FROM track WHERE (stcode1 = 'CST' OR stcode2 = 'CST');
DELETE FROM trainhalts WHERE (stcode = 'CST');
-- -- For Checking
SELECT * FROM station;
SELECT * FROM track;
SELECT * FROM trainhalts;

-
- 10. Remove Track “KP11” from the train table.If any train is removed from the train table t
hat track
-- related information also should be removed from the other tables.

DELETE FROM station WHERE stcode = 'KP11';
DELETE FROM track WHERE (stcode1 = 'KP11' OR stcode2 = 'KP11');
DELETE FROM trainhalts WHERE (stcode = 'KP11');
-- For Checking
SELECT * FROM station;
SELECT * FROM track;
SELECT * FROM trainhalts;
```

Initial Table:

A.) TRAIN TABLE

id	name
KP11	CST-KYN
KP11L	CST-KYN_LO
T129	CST-TNA_LO
A63	CST-DL_LOC
K101	CST-KYN_LO
N27	CST-TNA_LO
S33	CST-KGR_LO
A65	CST-AMR_LO

B.) STATION TABLE

stcode	name
CST	MUMBAI
BYC	BYCULLA
DR	DADAR
KRL	KURLA
GPR	GHATKOPAR
TNA	THANE
DL	DOMBIVALI
AMR	AMBARNATH
KYN	KALYAN
KSR	KASARA

C.) TRACK TABLE

stcode1	stcode2	distance
CST	BYC	5
CST	DR	9
CST	KRL	16
CST	GPR	20
CST	TNA	34
CST	DL	49
CST	KYN	54
CST	KSR	77
CST	AMR	65
BYC	DR	4
BYC	KRL	11
GRP	TNA	14
DR	TNA	25
KRL	KYN	38
TNA	KYN	20
TNA	KSR	43

D.) TRAIN HALTS TABLE

id	seqno	stcode	timein	timeout
KP11	0	CST	NULL	20.23
KP11	1	BYC	20.31	20.32
KP11	2	DR	20.41	20.42
KP11	3	GPR	20.52	20.53
KP11	4	GPR	20.52	20.53
KP11	5	DR	20.41	20.42
KP11	6	GPR	20.58	20.59
KP11	7	TNA	21.21	21.22
KP11	8	DL	21.45	21.46
KP11	9	KYN	21.54	NULL
A65	0	CST	NULL	20.52
A65	1	BYC	21.00	21.01
A65	2	DR	21.10	21.11
A65	3	KRL	21.22	21.23
A65	4	GPR	21.28	21.29
A65	5	TNA	21.49	21.50
A65	6	DL	22.13	22.14
A65	7	KYN	22.22	22.23
A65	8	AMR	22.36	NULL

1. Display all the pairs of stations with total distance for given source and destinations.

Query:

```
SELECT s1.name AS "START-POINT",s2.name AS "END-POINT", t.distance AS "DISTANCE"
FROM station s1,station s2, track t
WHERE s1.stcode==t.stcode1 AND s2.stcode==t.stcode2;
```

Output:

START-POINT	END-POINT	DISTANCE
MUMBAI	BYCULLA	5
MUMBAI	DADAR	9
MUMBAI	KURLA	16
MUMBAI	GHATKOPAR	20
MUMBAI	THANE	34
MUMBAI	DOMBIVALI	49
MUMBAI	KALYAN	54
MUMBAI	KASARA	77
MUMBAI	AMBARNATH	65
BYCULLA	DADAR	4
BYCULLA	KURLA	11
DADAR	THANE	25
KURLA	KALYAN	38
THANE	KALYAN	20
THANE	KASARA	43

2. Find the pairs of stations (station codes) which have a track with distance less than 20Kms between them.

Query:

```
SELECT s1.name AS "START-POINT",s2.name AS "END-POINT", t.distance AS "DISTANCE"
FROM station s1,station s2, track t
WHERE s1.stcode==t.stcode1 AND s2.stcode==t.stcode2 AND t.distance<20;
```

Output:

START-POINT	END-POINT	DISTANCE
MUMBAI	BYCULLA	5
MUMBAI	DADAR	9
MUMBAI	KURLA	16
BYCULLA	DADAR	4
BYCULLA	KURLA	11

3. Find the IDs of all the trains which have a stop at GHATKOPAR

Query:

```
SELECT DISTINCT t1.id AS "TRAIN-NO", t1.name AS "TRAIN-NAME"
FROM trainhalts th1,train t1
WHERE (th1.stcode=='GPR' AND th1.id==t1.id);
```

Output:

TRAIN-NO	TRAIN-NAME
KP11	CST-KYN
A65	CST-AMR_LO

4. Find the ordered list of names of all trains that start at MUMBAI.

Query:

```
SELECT s.name AS "TRAINS_STARTING_AT_MUMBAI"
FROM track t,station s
WHERE t.stcode1=='CST' AND t.stcode2==s.stcode ORDER BY s.name;
```

Output:

TRAINS_STARTING_AT_MUMBAI
AMBARNATH
BYCULLA
DADAR
DOMBIVALI
GHATKOPAR
KALYAN
KASARA
KURLA
THANE

By Default Also, The Output is Order by Name. [~~ORDER BY s.name~~]

5. List all the stations in order of visit by the train 'CST-AMR_LOCAL'.

Query:

```
SELECT s.name AS "STATIONS VISITED BY TRAIN 'CST-AMR_LOCAL'"
FROM trainhalts th, station s, train t
WHERE (t.name == 'CST-AMR_LOCAL' AND t.id == th.id AND th.stcode == s.stcode)
```

Output:

```
STATIONS VISITED BY TRAIN 'CST-AMR_LOCAL'
-----------------------------------------
MUMBAI
BYCULLA
DADAR
KURLA
GHATKOPAR
THANE
DOMBIVALI
KALYAN
AMBARNATH
```

6. Find the name of the trains which stop at Thane, before the 6th stop in the route of the train.

Query:

```
SELECT t.name AS "TRAINS STOPS AT THANE [BEFORE 6TH STOP IN ROUTE]"
FROM trainhalts th, train t
WHERE (th.seqno<6 AND th.id==t.id AND th.stcode == 'TNA');
```

Output:

```
TRAINS STOPS AT THANE [BEFORE 6TH STOP IN ROUTE]
------------------------------------------------
CST-AMR_LOCAL
```

7. Display the pair of stations (i.e. station names) having maximum distance between them.

Query:

```
SELECT s1.name AS "MAX DISTANCE STATION_1 [START]",s2.name AS "MAX DISTANCE STATION_2 [END]"
FROM track t,station s1,station s2
WHERE (t.distance = (SELECT MAX(distance) FROM track)) AND (t.stcode1==s1.stcode) AND (t.stco
de2==s2.stcode);
```

Output:

```
MAX DISTANCE STATION_1 [START]  MAX DISTANCE STATION_2 [END]
------------------------------ ----------------------------
MUMBAI                         KASARA
```

8. Display id of the trainhalt having second highest time out.

Query:

```
SELECT id AS "TRAIN-HALT ID WITH 2ND HIGHEST TIMEOUT",timeout FROM trainhalts
WHERE timeout = (
SELECT MAX(timeout)
FROM trainhalts
WHERE timeout NOT IN (SELECT MAX(timeout) FROM trainhalts));
```

Output:

TRAIN-HALT ID WITH 2ND HIGHEST TIMEOUT	timeout
A65	22.14

Highest Timeout = **22.23**|| Second Highest Timeout = **22.14**

9. Remove Track "CST" from the track table. Note: If any track is removed from the track table, then that track related information also should be removed from the other tables.

Query:

```
DELETE FROM station WHERE stcode = 'CST';
DELETE FROM track WHERE (stcode1 = 'CST' OR stcode2 = 'CST');
DELETE FROM trainhalts WHERE (stcode = 'CST');
-- For Checking
SELECT * FROM station;
SELECT * FROM track;
SELECT * FROM trainhalts;
```

Output:

```
stcode      name
----------  ----------
BYC         BYCULLA
DR          DADAR
KRL         KURLA
GPR         GHATKOPAR
TNA         THANE
DL          DOMBIVALI
AMR         AMBARNATH
KYN         KALYAN
KSR         KASARA
stcode1     stcode2     distance
----------  ----------  ----------
BYC         DR          4
BYC         KRL         11
GRP         TNA         14
DR          TNA         25
KRL         KYN         38
TNA         KYN         20
TNA         KSR         43
id          seqno       stcode      timein      timeout
----------  ----------  ----------  ----------  ----------
KP11        1           BYC         20.31       20.32
KP11        2           DR          20.41       20.42
KP11        3           GPR         20.52       20.53
KP11        4           GPR         20.52       20.53
KP11        5           DR          20.41       20.42
KP11        6           GPR         20.58       20.59
KP11        7           TNA         21.21       21.22
KP11        8           DL          21.45       21.46
KP11        9           KYN         21.54       NULL
A65         1           BYC         21.00       21.01
A65         2           DR          21.10       21.11
A65         3           KRL         21.22       21.23
A65         4           GPR         21.28       21.29
A65         5           TNA         21.49       21.50
A65         6           DL          22.13       22.14
A65         7           KYN         22.22       22.23
A65         8           AMR         22.36       NULL
```

10. Remove Track "KP11" from the train table. If any train is removed from the train table that track related information also should be removed from the other tables.

Query:

```sql
DELETE FROM station WHERE stcode = 'KP11';
DELETE FROM track WHERE (stcode1 = 'KP11' OR stcode2 = 'KP11');
DELETE FROM trainhalts WHERE (stcode = 'KP11');
-- For Checking
SELECT * FROM station;
SELECT * FROM track;
SELECT * FROM trainhalts;
```

Output:

```
stcode     name
---------- ----------
CST        MUMBAI
BYC        BYCULLA
DR         DADAR
KRL        KURLA
GPR        GHATKOPAR
TNA        THANE
DL         DOMBIVALI
AMR        AMBARNATH
KYN        KALYAN
KSR        KASARA
stcode1    stcode2    distance
---------- ---------- ----------
CST        BYC        5
CST        DR         9
CST        KRL        16
CST        GPR        20
CST        TNA        34
CST        DL         49
CST        KYN        54
CST        KSR        77
CST        AMR        65
BYC        DR         4
BYC        KRL        11
GRP        TNA        14
DR         TNA        25
KRL        KYN        38
TNA        KYN        20
TNA        KSR        43
id         seqno      stcode     timein     timeout
---------- ---------- ---------- ---------- ----------
KP11       0          CST        NULL       20.23
KP11       1          BYC        20.31      20.32
KP11       2          DR         20.41      20.42
KP11       3          GPR        20.52      20.53
KP11       4          GPR        20.52      20.53
KP11       5          DR         20.41      20.42
KP11       6          GPR        20.58      20.59
KP11       7          TNA        21.21      21.22
KP11       8          DL         21.45      21.46
KP11       9          KYN        21.54      NULL
A65        0          CST        NULL       20.52
A65        1          BYC        21.00      21.01
A65        2          DR         21.10      21.11
A65        3          KRL        21.22      21.23
A65        4          GPR        21.28      21.29
A65        5          TNA        21.49      21.50
A65        6          DL         22.13      22.14
A65        7          KYN        22.22      22.23
A65        8          AMR        22.36      NULL
```


Submitted By:

BHAGYA VINOD RANA

U19CS012