**Part 1 (10%)**

1. Specify functional dependencies in Penna (no trivial FDs please).

Functional dependencies in the penna dataset

1. Multi valued dependancy –happens when two variables are independent of each other but dependant on one value for example we have total votes and votes for candidate trump and biden

Biden votes are dependent on total votes such that they cant exceed the total votes but independent of trumps vote

1. Transitive dependancy is a type of functional dependency that happens when “x” is indirectly formed by two said functional dependencies. like when we know the precent and the locality we know the state as well as, when we know the state and precint we know the locality.

State → {locality,geo,precint }

1. Is Penna in BCNF? If not, decompose Penna into a BCNF scheme.

When we say if a database is in BCNF it simply means the tables have to be normalized even if they are in their 3NF

The penna table is not in BCNF since neither state nor totsl votes are keys

So to decompose to BCNF we decompose the penna table into tables

|  |  |  |  |
| --- | --- | --- | --- |
| State | Locality | Precint | geo |
|  |  |  |  |
|  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| state | locality | precint | geo | Total votes |
|  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| CandidateID | Name | Votes |
|  |  |  |

|  |  |
| --- | --- |
| State | CandidateID |
|  |  |

PART TWO

CREATE PROCEDURE Winner

@precint varchar(max)

AS

--showing who won this election

SELECT CASE

WHEN

(

SELECT SUM(Biden) AS 'Bvotes'

FROM Penna

where precinct = @precint

) >

(

SELECT SUM(Trump) AS 'Tvotes'

FROM Penna

where precinct = @precint

) THEN

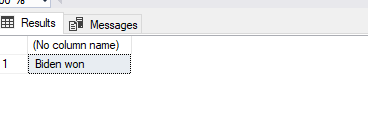
'Biden won'

ELSE

'Trump Won'

END

GO



CREATE PROCEDURE RankAll

@precinct varchar(max)

AS

select \* from(

SELECT precinct,

totalvotes,

RANK() OVER (PARTITION BY precinct ORDER BY totalvotes) rank

from Penna

)

a where precinct = @precinct

GO

CREATE PROCEDURE RankCounty

@precinct varchar(max)

AS

select \* from(

SELECT precinct,

totalvotes,

geo,

RANK() OVER (PARTITION BY precinct ORDER BY totalvotes) rank

from Penna

)

a where precinct = @precinct

GO

CREATE PROCEDURE EarliestPrecinct

@votecount int

AS

--select

SELECT TOP 1 precinct,

Timestamp,

SUM(totalvotes) AS TV

from Penna

WHERE TV = 2000

GO

CREATE PROCEDURE PrecinctWon

@candidate varchar(20)

AS

if @candidate = 'Biden'

SELECT precinct,

--Biden,

(Biden- Trump)as difference

FROM Penna

WHERE Biden > Trump

--SHOW THE DIFFERENCES

ELSE

SELECT precinct,

--Trump,

(Trump- Biden)as difference

FROM Penna

WHERE Trump > Biden

GO

CREATE PROCEDURE PrecinctWonCount

@candidate varchar(20)

AS

if @candidate = 'Biden'

SELECT COUNT(precinct) AS PrecinctCOUNT

FROM Penna

WHERE Biden > Trump

--SHOW THE DIFFERENCES

ELSE

SELECT COUNT(precinct) AS PrecinctCOUNT

FROM Penna

WHERE Trump > Biden

GO

CREATE PROCEDURE PrecinctsFullLead

@candidate varchar(20)

AS

if @candidate = 'Biden'

SELECT precinct,Timestamp

--Biden,

FROM Penna

WHERE Biden > Trump

--SHOW THE DIFFERENCES

ELSE

SELECT precinct,Timestamp

--Trump,

FROM Penna

WHERE Trump > Biden

GO

**Part 3 (10%)**

In addition, you are asked to write SQL queries to check if the following patterns are enforced in the database:

**a)** The sum of votes for Trump and Biden cannot be larger than totalvotes

**b)** There cannot be any tuples with timestamps later than Nov 11 and earlier than Nov3

**c)** Neither totalvotes, Trump’s votes nor Biden’s votes for any precinct and at any timestamp after 2020-11-05 00:00:00 will be smaller than the same attribute at the timestamp 2020-11-05 00:00:00 for that precinct.

--sum of total votes for trump cannot be more than totalvotes

SELECT CASE

WHEN(

select (biden+trump)

from penna

) >

(

SELECT totalvotes

from Penna

)THEN

'votes of both biden and trump cant exceed total votes'

ELSE

'sum of votes are ok'

END

CREATE PROCEDURE Totalvotes

@timestamp varchar(200),

@category varchar(20)

AS

IF @category = 'Biden'

SELECT precinct

FROM Penna

WHERE Biden > Trump AND Timestamp = @timestamp

ORDER BY Biden

ELSE

BEGIN

IF @category = 'Trump'

SELECT precinct

FROM Penna

WHERE Trump > Biden AND Timestamp = @timestamp

ORDER BY Trump

ELSE

SELECT precinct,

Trump,

Biden

FROM Penna

WHERE Timestamp = @timestamp

ORDER BY totalvotes

END;

GO

**Part 4 (30%)**

You should enforce integrity constraints in your database, by specifying the primary keys, as well as the foreign key (it will only be one).

--adds a primary key constraint on the penna table

ALTER TABLE Penna  
ADD PRIMARY KEY (ID);

ALTER TABLE Penna

ADD CONSTRAINT FK\_Tcandidate\_ FOREIGN KEY (candidateID)

REFERENCES candidates (ID)

ON DELETE CASCADE

ON UPDATE CASCADE