**-- Dropping the table if exist**

drop table machine\_downtime;

**-- creating the table as machine\_downtime**

CREATE TABLE machine\_downtime

(

Date date ,

Machine\_ID varchar(330) ,

Assembly\_Line\_No varchar(330) ,

Hydraulic\_Pressure\_bar float,

Coolant\_Pressure\_bar float,

Air\_System\_Pressure\_bar float,

Coolant\_Temperature float,

Hydraulic\_Oil\_Temperature\_Â°C float,

Spindle\_Bearing\_Temperature\_Â°C float,

Spindle\_Vibration\_Âµm float,

Tool\_Vibration\_Âµm float,

Spindle\_Speed\_RPM int,

Voltage\_volts int,

Torque\_Nm float,

Cutting\_kN float,

Downtime varchar(225)

);

**-- Importing the data of csv file in table as machine\_downtime**

SET datestyle = dmy;

copy machine\_downtime from 'C:\Users\DELL\Desktop\postgressql\360digitmg internship\Machine Downtime.csv'DELIMITER ',' CSV HEADER;

**-- To show the table**

select \* from machine\_downtime;

**-- Descriptive statistics summary**

SELECT

'Hydraulic\_Pressure\_bar' AS variable\_name,

AVG(Hydraulic\_Pressure\_bar) AS mean,

var\_samp(Hydraulic\_Pressure\_bar) AS variance,

STDDEV\_samp(Hydraulic\_Pressure\_bar) AS stddev,

MIN(Hydraulic\_Pressure\_bar) AS min,

MAX(Hydraulic\_Pressure\_bar) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Hydraulic\_Pressure\_bar), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Hydraulic\_Pressure\_bar), 4)) AS kurtosis

FROM (

SELECT

Hydraulic\_Pressure\_bar,

POWER(Hydraulic\_Pressure\_bar - AVG(Hydraulic\_Pressure\_bar) OVER (), 3) AS cubed\_diff,

POWER(Hydraulic\_Pressure\_bar - AVG(Hydraulic\_Pressure\_bar) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Coolant\_Pressure\_bar' as variable\_name,

AVG(Coolant\_Pressure\_bar)as mean,

var\_samp(Coolant\_Pressure\_bar)as variance,

STDDEV\_samp(Coolant\_pressure\_bar) AS stddev,

MIN(Coolant\_pressure\_bar) AS min,

MAX(Coolant\_pressure\_bar) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Coolant\_Pressure\_bar), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Coolant\_Pressure\_bar), 4)) AS kurtosis

FROM (

SELECT

Coolant\_Pressure\_bar,

POWER(Coolant\_Pressure\_bar - AVG(Coolant\_Pressure\_bar) OVER (), 3) AS cubed\_diff,

POWER(Coolant\_Pressure\_bar - AVG(Coolant\_Pressure\_bar) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Air\_System\_Pressure\_bar' as variable\_name,

AVG(Air\_System\_Pressure\_bar)as mean,

var\_samp(Air\_System\_Pressure\_bar)as variance,

STDDEV\_samp(Air\_System\_Pressure\_bar) AS stddev,

MIN(Air\_System\_Pressure\_bar) AS min,

MAX(Air\_System\_Pressure\_bar) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Air\_System\_Pressure\_bar), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Air\_System\_Pressure\_bar), 4)) AS kurtosis

FROM (

SELECT

Air\_System\_Pressure\_bar,

POWER(Air\_System\_Pressure\_bar - AVG(Air\_System\_Pressure\_bar) OVER (), 3) AS cubed\_diff,

POWER(Air\_System\_Pressure\_bar - AVG(Air\_System\_Pressure\_bar) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Coolant\_Temperature' as variable\_name,

AVG(Coolant\_Temperature)as mean,

var\_samp(Coolant\_Temperature)as variance,

STDDEV\_samp(Coolant\_Temperature) AS stddev,

MIN(Coolant\_Temperature) AS min,

MAX(Coolant\_Temperature) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Coolant\_Temperature), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Coolant\_Temperature), 4)) AS kurtosis

FROM (

SELECT

Coolant\_Temperature,

POWER(Coolant\_Temperature - AVG(Coolant\_Temperature) OVER (), 3) AS cubed\_diff,

POWER(Coolant\_Temperature - AVG(Coolant\_Temperature) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Hydraulic\_Oil\_Temperature\_Â°C' as variable\_name,

AVG(Hydraulic\_Oil\_Temperature\_Â°C)as mean,

var\_samp(Hydraulic\_Oil\_Temperature\_Â°C)as variance,

STDDEV\_samp(Hydraulic\_Oil\_Temperature\_Â°C) AS stddev,

MIN(Hydraulic\_Oil\_Temperature\_Â°C) AS min,

MAX(Hydraulic\_Oil\_Temperature\_Â°C) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Hydraulic\_Oil\_Temperature\_Â°C), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Hydraulic\_Oil\_Temperature\_Â°C), 4)) AS kurtosis

FROM (

SELECT

Hydraulic\_Oil\_Temperature\_Â°C,

POWER(Hydraulic\_Oil\_Temperature\_Â°C - AVG(Hydraulic\_Oil\_Temperature\_Â°C) OVER (), 3) AS cubed\_diff,

POWER(Hydraulic\_Oil\_Temperature\_Â°C - AVG(Hydraulic\_Oil\_Temperature\_Â°C) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Spindle\_Bearing\_Temperature\_Â°C' as variable\_name,

AVG(Spindle\_Bearing\_Temperature\_Â°C)as mean,

var\_samp(Spindle\_Bearing\_Temperature\_Â°C)as variance,

STDDEV\_samp(Spindle\_Bearing\_Temperature\_Â°C) AS stddev,

MIN(Spindle\_Bearing\_Temperature\_Â°C) AS min,

MAX(Spindle\_Bearing\_Temperature\_Â°C) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Bearing\_Temperature\_Â°C), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Bearing\_Temperature\_Â°C), 4)) AS kurtosis

FROM (

SELECT

Spindle\_Bearing\_Temperature\_Â°C,

POWER(Spindle\_Bearing\_Temperature\_Â°C - AVG(Spindle\_Bearing\_Temperature\_Â°C) OVER (), 3) AS cubed\_diff,

POWER(Spindle\_Bearing\_Temperature\_Â°C - AVG(Spindle\_Bearing\_Temperature\_Â°C) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Spindle\_Vibration\_Âµm' as variable\_name,

AVG(Spindle\_Vibration\_Âµm)as mean,

var\_samp(Spindle\_Vibration\_Âµm)as variance,

STDDEV\_samp(Spindle\_Vibration\_Âµm) AS stddev,

MIN(Spindle\_Vibration\_Âµm) AS min,

MAX(Spindle\_Vibration\_Âµm) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Vibration\_Âµm), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Vibration\_Âµm), 4)) AS kurtosis

FROM (

SELECT

Spindle\_Vibration\_Âµm,

POWER(Spindle\_Vibration\_Âµm - AVG(Spindle\_Vibration\_Âµm) OVER (), 3) AS cubed\_diff,

POWER(Spindle\_Vibration\_Âµm - AVG(Spindle\_Vibration\_Âµm) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Tool\_Vibration\_Âµm' as variable\_name,

AVG(Tool\_Vibration\_Âµm)as mean,

var\_samp(Tool\_Vibration\_Âµm)as variance,

STDDEV\_samp(Tool\_Vibration\_Âµm) AS stddev,

MIN(Tool\_Vibration\_Âµm) AS min,

MAX(Tool\_Vibration\_Âµm) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Tool\_Vibration\_Âµm), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Tool\_Vibration\_Âµm), 4)) AS kurtosis

FROM (

SELECT

Tool\_Vibration\_Âµm,

POWER(Tool\_Vibration\_Âµm - AVG(Tool\_Vibration\_Âµm) OVER (), 3) AS cubed\_diff,

POWER(Tool\_Vibration\_Âµm - AVG(Tool\_Vibration\_Âµm) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Spindle\_Speed\_RPM' as variable\_name,

AVG(Spindle\_Speed\_RPM)as mean,

var\_samp(Spindle\_Speed\_RPM)as variance,

STDDEV\_samp(Spindle\_Speed\_RPM) AS stddev,

MIN(Spindle\_Speed\_RPM) AS min,

MAX(Spindle\_Speed\_RPM) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Speed\_RPM), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Spindle\_Speed\_RPM), 4)) AS kurtosis

FROM (

SELECT

Spindle\_Speed\_RPM,

POWER(Spindle\_Speed\_RPM - AVG(Spindle\_Speed\_RPM) OVER (), 3) AS cubed\_diff,

POWER(Spindle\_Speed\_RPM - AVG(Spindle\_Speed\_RPM) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Voltage\_volts' as variable\_name,

AVG(Voltage\_volts)as mean,

var\_samp(Voltage\_volts)as variance,

STDDEV\_samp(Voltage\_volts) AS stddev,

MIN(Voltage\_volts) AS min,

MAX(Voltage\_volts) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Voltage\_volts), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Voltage\_volts), 4)) AS kurtosis

FROM (

SELECT

Voltage\_volts,

POWER(Voltage\_volts - AVG(Voltage\_volts) OVER (), 3) AS cubed\_diff,

POWER(Voltage\_volts - AVG(Voltage\_volts) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Torque\_Nm' as variable\_name,

AVG(Torque\_Nm)as mean,

var\_samp(Torque\_Nm)as variance,

STDDEV\_samp(Torque\_Nm) AS stddev,

MIN(Torque\_Nm) AS min,

MAX(Torque\_Nm) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Torque\_Nm), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Torque\_Nm), 4)) AS kurtosis

FROM (

SELECT

Torque\_Nm,

POWER(Torque\_Nm - AVG(Torque\_Nm) OVER (), 3) AS cubed\_diff,

POWER(Torque\_Nm - AVG(Torque\_Nm) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery

UNION ALL

select

'Cutting\_kN' as variable\_name,

AVG(Cutting\_kN)as mean,

var\_samp(Cutting\_kN)as variance,

STDDEV\_samp(Cutting\_kN) AS stddev,

MIN(Cutting\_kN) AS min,

MAX(Cutting\_kN) AS max,

SUM(cubed\_diff) / (COUNT(\*) \* POWER(STDDEV(Cutting\_kN), 3)) AS skewness,

SUM(fourth\_power\_diff) / (COUNT(\*) \* POWER(STDDEV(Cutting\_kN), 4)) AS kurtosis

FROM (

SELECT

Cutting\_kN,

POWER(Cutting\_kN - AVG(Cutting\_kN) OVER (), 3) AS cubed\_diff,

POWER(Cutting\_kN - AVG(Cutting\_kN) OVER (), 4) AS fourth\_power\_diff

FROM machine\_downtime

) subquery;

**-- Correlation**

SELECT

'Correlation' AS statistics,

NULL AS date,

NULL AS machine\_id,

NULL AS assembly\_line\_no,

CORR(Hydraulic\_Pressure\_bar, Coolant\_Pressure\_bar) AS hydraulic\_coolant\_corr,

CORR(Hydraulic\_Pressure\_bar, Air\_System\_Pressure\_bar) AS hydraulic\_air\_corr,

CORR(Hydraulic\_Pressure\_bar, Coolant\_Temperature) AS hydraulic\_coolant\_temp\_corr,

CORR(Hydraulic\_Pressure\_bar, Hydraulic\_Oil\_Temperature\_Â°C) AS hydraulic\_oil\_temp\_corr,

CORR(Hydraulic\_Pressure\_bar, Spindle\_Bearing\_Temperature\_Â°C) AS hydraulic\_bearing\_temp\_corr,

CORR(Hydraulic\_Pressure\_bar, Spindle\_Vibration\_Âµm) AS hydraulic\_spindle\_vib\_corr,

CORR(Hydraulic\_Pressure\_bar, Tool\_Vibration\_Âµm) AS hydraulic\_tool\_vib\_corr,

CORR(Hydraulic\_Pressure\_bar, Spindle\_Speed\_RPM) AS hydraulic\_spindle\_speed\_corr,

CORR(Hydraulic\_Pressure\_bar, Voltage\_volts) AS hydraulic\_voltage\_corr,

CORR(Hydraulic\_Pressure\_bar, Torque\_Nm) AS hydraulic\_torque\_corr,

CORR(Hydraulic\_Pressure\_bar, Cutting\_kN) AS hydraulic\_cutting\_corr,

CORR(Coolant\_Pressure\_bar, Air\_System\_Pressure\_bar) AS coolant\_air\_corr,

CORR(Coolant\_Pressure\_bar, Coolant\_Temperature) AS coolant\_temp\_corr,

CORR(Coolant\_Pressure\_bar, Hydraulic\_Oil\_Temperature\_Â°C) AS coolant\_oil\_temp\_corr,

CORR(Coolant\_Pressure\_bar, Spindle\_Bearing\_Temperature\_Â°C) AS coolant\_bearing\_temp\_corr,

CORR(Coolant\_Pressure\_bar, Spindle\_Vibration\_Âµm) AS coolant\_spindle\_vib\_corr,

CORR(Coolant\_Pressure\_bar, Tool\_Vibration\_Âµm) AS coolant\_tool\_vib\_corr,

CORR(Coolant\_Pressure\_bar, Spindle\_Speed\_RPM) AS coolant\_spindle\_speed\_corr,

CORR(Coolant\_Pressure\_bar, Voltage\_volts) AS coolant\_voltage\_corr,

CORR(Coolant\_Pressure\_bar, Torque\_Nm) AS coolant\_torque\_corr,

CORR(Coolant\_Pressure\_bar, Cutting\_kN) AS coolant\_cutting\_corr,

CORR(Air\_System\_Pressure\_bar, Coolant\_Temperature) AS air\_coolant\_temp\_corr,

CORR(Air\_System\_Pressure\_bar, Hydraulic\_Oil\_Temperature\_Â°C) AS air\_oil\_temp\_corr,

CORR(Air\_System\_Pressure\_bar, Spindle\_Bearing\_Temperature\_Â°C) AS air\_bearing\_temp\_corr,

CORR(Air\_System\_Pressure\_bar, Spindle\_Vibration\_Âµm) AS air\_spindle\_vib\_corr,

CORR(Air\_System\_Pressure\_bar, Tool\_Vibration\_Âµm) AS air\_tool\_vib\_corr,

CORR(Air\_System\_Pressure\_bar, Spindle\_Speed\_RPM) AS air\_spindle\_speed\_corr,

CORR(Air\_System\_Pressure\_bar, Voltage\_volts) AS air\_voltage\_corr,

CORR(Air\_System\_Pressure\_bar, Torque\_Nm) AS air\_torque\_corr,

CORR(Air\_System\_Pressure\_bar, Cutting\_kN) AS air\_cutting\_corr,

CORR(Coolant\_Temperature, Hydraulic\_Oil\_Temperature\_Â°C) AS coolant\_oil\_temp\_corr,

CORR(Coolant\_Temperature, Spindle\_Bearing\_Temperature\_Â°C) AS coolant\_bearing\_temp\_corr,

CORR(Coolant\_Temperature, Spindle\_Vibration\_Âµm) AS coolant\_spindle\_vib\_corr,

CORR(Coolant\_Temperature, Tool\_Vibration\_Âµm) AS coolant\_tool\_vib\_corr,

CORR(Coolant\_Temperature, Spindle\_Speed\_RPM) AS coolant\_spindle\_speed\_corr,

CORR(Coolant\_Temperature, Voltage\_volts) AS coolant\_voltage\_corr,

CORR(Coolant\_Temperature, Torque\_Nm) AS coolant\_torque\_corr,

CORR(Coolant\_Temperature, Cutting\_kN) AS coolant\_cutting\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Spindle\_Bearing\_Temperature\_Â°C) AS oil\_bearing\_temp\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Spindle\_Vibration\_Âµm) AS oil\_spindle\_vib\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Tool\_Vibration\_Âµm) AS oil\_tool\_vib\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Spindle\_Speed\_RPM) AS oil\_spindle\_speed\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Voltage\_volts) AS oil\_voltage\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Torque\_Nm) AS oil\_torque\_corr,

CORR(Hydraulic\_Oil\_Temperature\_Â°C, Cutting\_kN) AS oil\_cutting\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Spindle\_Vibration\_Âµm) AS bearing\_spindle\_vib\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Tool\_Vibration\_Âµm) AS bearing\_tool\_vib\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Spindle\_Speed\_RPM) AS bearing\_spindle\_speed\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Voltage\_volts) AS bearing\_voltage\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Torque\_Nm) AS bearing\_torque\_corr,

CORR(Spindle\_Bearing\_Temperature\_Â°C, Cutting\_kN) AS bearing\_cutting\_corr,

CORR(Spindle\_Vibration\_Âµm, Tool\_Vibration\_Âµm) AS spindle\_tool\_vib\_corr,

CORR(Spindle\_Vibration\_Âµm, Spindle\_Speed\_RPM) AS spindle\_speed\_vib\_corr,

CORR(Spindle\_Vibration\_Âµm, Voltage\_volts) AS spindle\_voltage\_corr,

CORR(Spindle\_Vibration\_Âµm, Torque\_Nm) AS spindle\_torque\_corr,

CORR(Spindle\_Vibration\_Âµm, Cutting\_kN) AS spindle\_cutting\_corr,

CORR(Tool\_Vibration\_Âµm, Spindle\_Speed\_RPM) AS tool\_spindle\_speed\_corr,

CORR(Tool\_Vibration\_Âµm, Voltage\_volts) AS tool\_voltage\_corr,

CORR(Tool\_Vibration\_Âµm, Torque\_Nm) AS tool\_torque\_corr,

CORR(Tool\_Vibration\_Âµm, Cutting\_kN) AS tool\_cutting\_corr,

CORR(Spindle\_Speed\_RPM, Voltage\_volts) AS spindle\_voltage\_corr,

CORR(Spindle\_Speed\_RPM, Torque\_Nm) AS spindle\_torque\_corr,

CORR(Spindle\_Speed\_RPM, Cutting\_kN) AS spindle\_cutting\_corr,

CORR(Voltage\_volts, Torque\_Nm) AS voltage\_torque\_corr,

CORR(Voltage\_volts, Cutting\_kN) AS voltage\_cutting\_corr,

CORR(Torque\_Nm, Cutting\_kN) AS torque\_cutting\_corr,

NULL AS downtime

FROM machine\_downtime;

**-- To find the count of data in table**

select count(\*)

from machine\_downtime;

SELECT Downtime, COUNT(\*) AS num\_events

FROM machine\_downtime

GROUP BY Downtime

ORDER BY num\_events DESC;

**-- To find different Machine\_Id and their count**

select Machine\_ID,count(\*)

from machine\_downtime

group by Machine\_ID

having count(\*)>1;

**-- To find different Assembly\_line\_no and their count**

select Assembly\_line\_no ,count(\*)

from machine\_downtime

group by Assembly\_line\_no

having count(\*)>1;

**-- to identify count of machine in different assembly\_line**

select Machine\_ID, Assembly\_Line\_No, count(\*)

from machine\_downtime

group by Machine\_ID, Assembly\_Line\_No

order by Machine\_ID

**-- to identify count of machine\_id which has machine failure and which assembly\_line\_no it is assigned**

select Machine\_ID, Assembly\_Line\_No,Downtime, count(\*)

from machine\_downtime

group by Machine\_ID, Assembly\_Line\_No,Downtime

order by Machine\_ID