INDIAN INSTITUTE OF INFORMATION TECHNOLOGY SURAT

LAB REPORT

on

ADVANCED DATABASE MANAGEMENT (CS 604)

Submitted by

[ANKIT GONDHA] (UI21CS10)

Course Faculty

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Assignment 1

Aim:

Create a Database for an Organization and create the following tables in the Organization Database:
Employee(EMP_ID(PK), FIRST_NAME, LAST_NAME, SALARY, JOINING_DATE, EPARTMENT)
Bonus (EMP_REF_ID(FK EMP_ID), BONUS_AMOUNT, BONUS_DATE)
Title (EMP_REF_ID(FKEMP_ID), EMP_TITLE, AFFECTED_FROM)
Insert a minimum of 50 records in each table.

Retrieve the following information from the Organization database:

1. SQL query to print all Employee details from the Employee table order by FIRST_NAME Ascending and DEPARTMENT Descending.
2. SQL query to fetch the count of employees working in the department 'Admin'.
3. SQL query to fetch Employee names with salaries >= 50000 and <= 100000.
4. SQL query to print details of the Workers who are also Managers.
5. SQL query to fetch duplicate records having matching data in some fields of a table.
6. SQL query to show only even rows from a table.
7. SQL query to show records from one table that another table does not have. Find employees in employee table that do not exist in bonus table (i.e. who did not get bonus)
8. SQL query to show the to pn(say10) records of a table.
9. Find people who have the same salary
10. SQL query to fetch the first 50% records from a table.
11. Find the highest 2 salaries without LIMIT or TOP.
12. Create a trigger to ensure that no employee of age less than 18 can be inserted in the database.
13. Create a trigger which will work before deletion in employee table and create a duplicate copy of the record in another table employee_backup.
14. Create a trigger to count number of new tupples inserted using each insert statement.

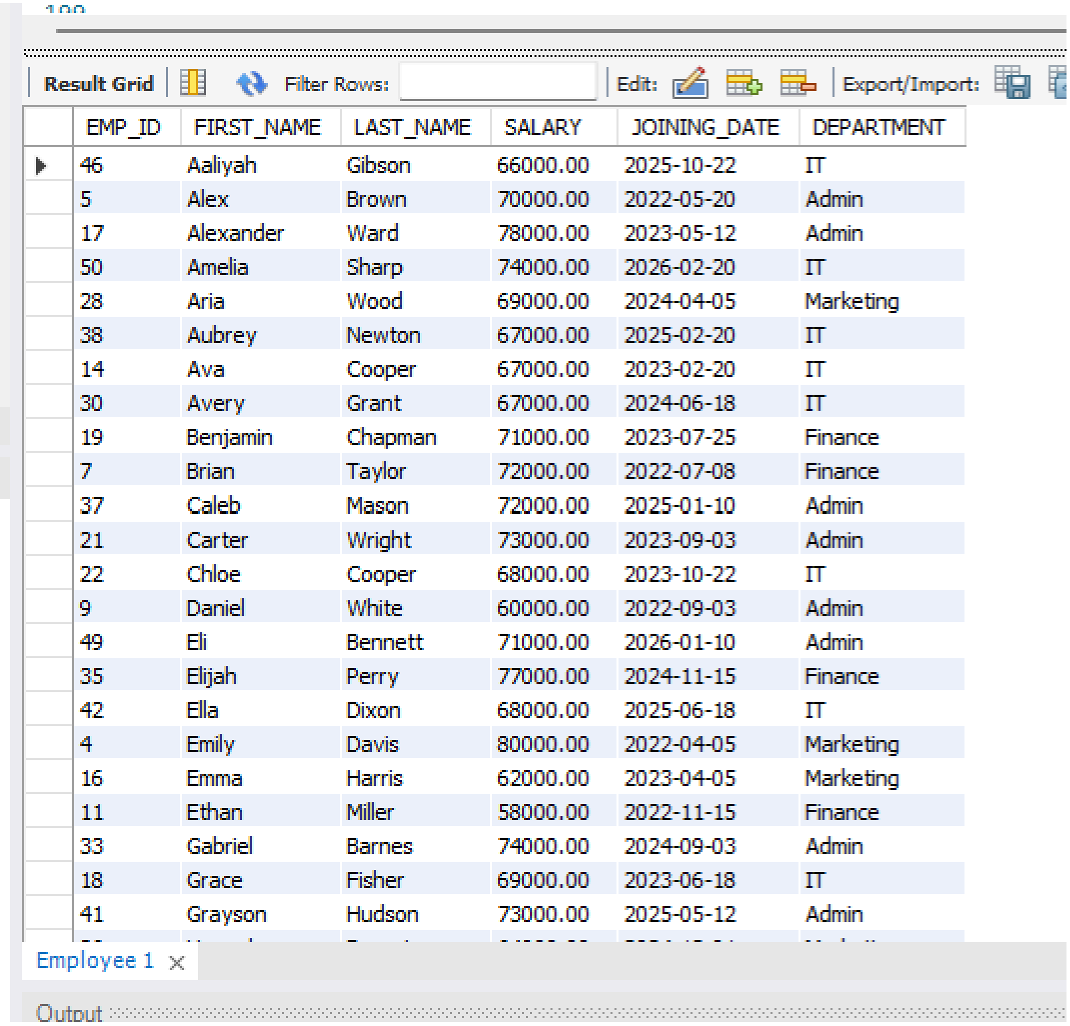
Code :

```
CREATE DATABASE lab1_final;
USE lab1_final;

CREATE TABLE Employee (
    EMP_ID INT PRIMARY KEY,
    FIRST_NAME VARCHAR(50),
    LAST_NAME VARCHAR(50),
    SALARY DECIMAL(10, 2),
    JOINING_DATE DATE,
    DEPARTMENT VARCHAR(50)
);

CREATE TABLE Bonus (
    EMP_REF_ID INT,
    BONUS_AMOUNT DECIMAL(10, 2),
    BONUS_DATE DATE,
    FOREIGN KEY (EMP_REF_ID) REFERENCES Employee(EMP_ID)
);

CREATE TABLE Title (
    EMP_REF_ID INT,
    EMP_TITLE VARCHAR(50),
    AFFECTED_FROM DATE,
    FOREIGN KEY (EMP_REF_ID) REFERENCES Employee(EMP_ID)
);

INSERT INTO Employee VALUES
(1, 'John', 'Doe', 60000, '2022-01-01', 'Admin'),
(2, 'Jane', 'Smith', 75000, '2022-02-15', 'IT'),
(3, 'Michael', 'Johnson', 55000, '2022-03-10', 'Finance'),
(4, 'Emily', 'Davis', 80000, '2022-04-05', 'Marketing'),
(5, 'Alex', 'Brown', 70000, '2022-05-20', 'Admin'),
(6, 'Jessica', 'Lee', 65000, '2022-06-12', 'IT'),
(7, 'Brian', 'Taylor', 72000, '2022-07-08', 'Finance'),
(8, 'Sophia', 'Clark', 68000, '2022-08-15', 'Marketing'),
(9, 'Daniel', 'White', 60000, '2022-09-03', 'Admin'),
(10, 'Olivia', 'Turner', 78000, '2022-10-22', 'IT'),
(11, 'Ethan', 'Miller', 58000, '2022-11-15', 'Finance'),
(12, 'Mia', 'Moore', 85000, '2022-12-01', 'Marketing'),
(13, 'Jacob', 'Hill', 72000, '2023-01-10', 'Admin'),
(14, 'Ava', 'Cooper', 67000, '2023-02-20', 'IT'),
(15, 'William', 'Baker', 74000, '2023-03-15', 'Finance'),
(16, 'Emma', 'Harris', 62000, '2023-04-05', 'Marketing'),
(17, 'Alexander', 'Ward', 78000, '2023-05-12', 'Admin'),
(18, 'Grace', 'Fisher', 69000, '2023-06-18', 'IT'),
(19, 'Benjamin', 'Chapman', 71000, '2023-07-25', 'Finance'),
(20, 'Lily', 'Lopez', 60000, '2023-08-10', 'Marketing'),
(21, 'Carter', 'Wright', 73000, '2023-09-03', 'Admin'),
(22, 'Chloe', 'Cooper', 68000, '2023-10-22', 'IT'),
(23, 'Owen', 'Perry', 77000, '2023-11-15', 'Finance'),
(24, 'Harper', 'Gray', 65000, '2023-12-01', 'Marketing'),
(25, 'Mason', 'Reid', 80000, '2024-01-10', 'Admin'),
(26, 'Scarlett', 'Lane', 70000, '2024-02-20', 'IT'),
(27, 'Logan', 'Ferguson', 72000, '2024-03-15', 'Finance'),
(28, 'Aria', 'Wood', 69000, '2024-04-05', 'Marketing'),
(29, 'Sebastian', 'Hunter', 75000, '2024-05-12', 'Admin'),
(30, 'Avery', 'Grant', 67000, '2024-06-18', 'IT'),
(31, 'Jackson', 'Ross', 80000, '2024-07-25', 'Finance'),
(32, 'Sophie', 'Mitchell', 62000, '2024-08-10', 'Marketing'),
(33, 'Gabriel', 'Barnes', 74000, '2024-09-03', 'Admin'),
(34, 'Madison', 'Wells', 69000, '2024-10-22', 'IT'),
(35, 'Elijah', 'Perry', 77000, '2024-11-15', 'Finance'),
(36, 'Hannah', 'Bryant', 64000, '2024-12-01', 'Marketing'),
(37, 'Caleb', 'Mason', 72000, '2025-01-10', 'Admin'),
(38, 'Aubrey', 'Newton', 67000, '2025-02-20', 'IT'),
(39, 'Lincoln', 'Clark', 80000, '2025-03-15', 'Finance'),
(40, 'Penelope', 'Harrison', 64000, '2025-04-05', 'Marketing'),
(41, 'Grayson', 'Hudson', 73000, '2025-05-12', 'Admin'),
(42, 'Ella', 'Dixon', 68000, '2025-06-18', 'IT'),
(43, 'Nathan', 'Stone', 77000, '2025-07-25', 'Finance'),
(44, 'Sofia', 'Porter', 65000, '2025-08-10', 'Marketing'),
(45, 'Liam', 'Fletcher', 79000, '2025-09-03', 'Admin'),
(46, 'Aaliyah', 'Gibson', 66000, '2025-10-22', 'IT'),
(47, 'Jack', 'Wagner', 75000, '2025-11-15', 'Finance'),
(48, 'Nora', 'Lloyd', 67000, '2025-12-01', 'Marketing'),
(49, 'Eli', 'Bennett', 71000, '2026-01-10', 'Admin'),
(50, 'Amelia', 'Sharp', 74000, '2026-02-20', 'IT');

INSERT INTO Bonus VALUES
(1, 5000, '2022-02-01'),
(2, 3000, '2022-03-10'),
(3, 2000, '2022-04-15'),
(4, 6000, '2022-05-02'),
(5, 4000, '2022-06-18'),
(6, 2500, '2022-07-25'),
(7, 3500, '2022-08-10'),
(8, 4500, '2022-09-20'),
(9, 1000, '2022-10-05'),
(10, 6000, '2022-11-15'),
(11, 1500, '2022-12-01'),
(12, 5000, '2023-01-10'),
(13, 3000, '2023-02-20'),
(14, 2000, '2023-03-15'),
(15, 6000, '2023-04-05'),
(16, 4000, '2023-05-12'),
(17, 2500, '2023-06-18'),
(18, 3500, '2023-07-25'),
(19, 4500, '2023-08-10'),
(20, 1000, '2023-09-03'),
(21, 3000, '2023-10-22'),
(22, 2000, '2023-11-15'),
(23, 6000, '2023-12-01'),
(24, 4000, '2024-01-10'),
(25, 2500, '2024-02-20'),
(26, 3500, '2024-03-15'),
(27, 4500, '2024-04-05'),
(28, 1000, '2024-05-12'),
(29, 6000, '2024-06-18'),
(30, 1500, '2024-07-25'),
(31, 5000, '2024-08-10'),
(32, 3000, '2024-09-03'),
(33, 2000, '2024-10-22'),
(34, 6000, '2024-11-15'),
(35, 4000, '2024-12-01'),
(36, 2500, '2025-01-10'),
(37, 3500, '2025-02-20'),
(38, 4500, '2025-03-15'),
(39, 1000, '2025-04-05'),
(40, 6000, '2025-05-12'),
(41, 1500, '2025-06-18'),
(42, 5000, '2025-07-25'),
(43, 3000, '2025-08-10'),
(44, 2000, '2025-09-03'),
(45, 6000, '2025-10-22'),
(46, 4000, '2025-11-15'),
(47, 2500, '2025-12-01'),
(48, 3500, '2026-01-10'),
(49, 4500, '2026-02-20'),
(50, 1000, '2026-03-15');

-- Inserting 50 records into the Title Table
INSERT INTO Title VALUES
(1, 'Manager', '2022-01-01'),
(2, 'Developer', '2022-02-20'),
(3, 'Analyst', '2022-03-15'),
(4, 'Supervisor', '2022-04-20'),
(5, 'Coordinator', '2022-05-05'),
(6, 'Designer', '2022-06-30'),
(7, 'Specialist', '2022-07-10'),
(8, 'Team Lead', '2022-08-25'),
(9, 'Assistant', '2022-09-15'),
(10, 'Senior Developer', '2022-10-30'),
(11, 'Junior Analyst', '2022-11-15'),
(12, 'Project Manager', '2022-12-01'),
(13, 'UI/UX Designer', '2023-01-10'),
(14, 'Technical Lead', '2023-02-20'),
(15, 'Data Scientist', '2023-03-15'),
(16, 'Marketing Manager', '2023-04-05'),
(17, 'HR Coordinator', '2023-05-12'),
(18, 'Financial Analyst', '2023-06-18'),
(19, 'Operations Specialist', '2023-07-25'),
(20, 'Product Manager', '2023-08-10'),
(21, 'QA Engineer', '2023-09-03'),
(22, 'Systems Analyst', '2023-10-22'),
(23, 'Sales Representative', '2023-11-15'),
(24, 'Customer Support', '2023-12-01'),
(25, 'Network Engineer', '2024-01-10'),
(26, 'Content Writer', '2024-02-20'),
(27, 'UX Researcher', '2024-03-15'),
(28, 'Business Analyst', '2024-04-05'),
(29, 'Legal Counsel', '2024-05-12'),
(30, 'Financial Planner', '2024-06-18'),
(31, 'IT Specialist', '2024-07-25'),
(32, 'Event Coordinator', '2024-08-10'),
(33, 'Logistics Manager', '2024-09-03'),
(34, 'Security Analyst', '2024-10-22'),
(35, 'Public Relations', '2024-11-15'),
(36, 'Graphic Designer', '2024-12-01'),
(37, 'Database Administrator', '2025-01-10'),
(38, 'Health and Safety', '2025-02-20'),
(39, 'Software Engineer', '2025-03-15'),
(40, 'Recruitment Specialist', '2025-04-05'),
(41, 'Technical Support', '2025-05-12'),
(42, 'Facilities Manager', '2025-06-18'),
(43, 'Executive Assistant', '2025-07-25'),
(44, 'Quality Assurance', '2025-08-10'),
(45, 'Market Researcher', '2025-09-03'),
(46, 'Systems Administrator', '2025-10-22'),
(47, 'Creative Director', '2025-11-15'),
(48, 'Data Analyst', '2025-12-01'),
(49, 'E-commerce Specialist', '2026-01-10'),
(50, 'Software Architect', '2026-02-20');


-- Query1
SELECT * FROM Employee
ORDER BY FIRST_NAME ASC, DEPARTMENT DESC;

-- Query2
SELECT COUNT(*) AS EmployeeCount
FROM Employee
WHERE DEPARTMENT = 'Admin';

-- Query3
SELECT FIRST_NAME, LAST_NAME
FROM Employee
WHERE SALARY BETWEEN 50000 AND 100000;

-- Query4
SELECT e.*
FROM Employee e
JOIN Title t ON e.EMP_ID = t.EMP_REF_ID
WHERE t.EMP_TITLE = 'Manager';

-- Query5
SELECT EMP_ID, COUNT(*)
FROM Employee
GROUP BY EMP_ID
HAVING COUNT(*) > 1;

-- Query6
SELECT *
FROM Employee
WHERE EMP_ID % 2 = 0;

-- Query7
SELECT e.*
FROM Employee e
LEFT JOIN Bonus b ON e.EMP_ID = b.EMP_REF_ID
WHERE b.EMP_REF_ID IS NULL;

-- Query8
SELECT *
FROM Employee
LIMIT 10;

-- Query9
SELECT SALARY, COUNT(*)
FROM Employee
GROUP BY SALARY
HAVING COUNT(*) > 1;
```

```
-- Query10
SELECT *
FROM Employee
ORDER BY EMP_ID;

-- Query11
SELECT DISTINCT SALARY
FROM Employee
ORDER BY SALARY DESC
LIMIT 2;

-- Query12
DELIMITER //
CREATE TRIGGER before_insert_employee
BEFORE INSERT ON Employee
FOR EACH ROW
BEGIN
  IF DATEDIFF(CURDATE(), NEW.JOINING_DATE) < 6570 THEN
    SIGNAL SQLSTATE '45000'
    SET MESSAGE_TEXT = 'Employee must be at least 18 years old.';
  END IF;
END;
//
DELIMITER ;

-- Query13
DELIMITER //
CREATE TRIGGER before_delete_employee
BEFORE DELETE ON Employee
FOR EACH ROW
BEGIN
  INSERT INTO employee_backup VALUES (OLD.EMP_ID, OLD.FIRST_NAME, OLD.LAST_NAME, OLD.SALARY,
OLD.JOINING_DATE, OLD.DEPARTMENT);
END;
//
DELIMITER ;

-- Query14
DELIMITER //
CREATE TRIGGER after_insert_employee
AFTER INSERT ON Employee
FOR EACH ROW
BEGIN
  INSERT INTO insert_count VALUES (NEW.EMP_ID, NOW());
END;
//
DELIMITER ;
```

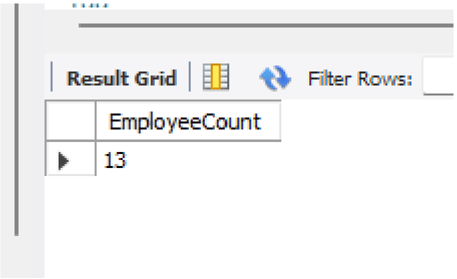
Output:

-- 1. SQL query to print all Employee details from the Employee table order by FIRST_NAME Ascending and DEPARTMENT Descending.



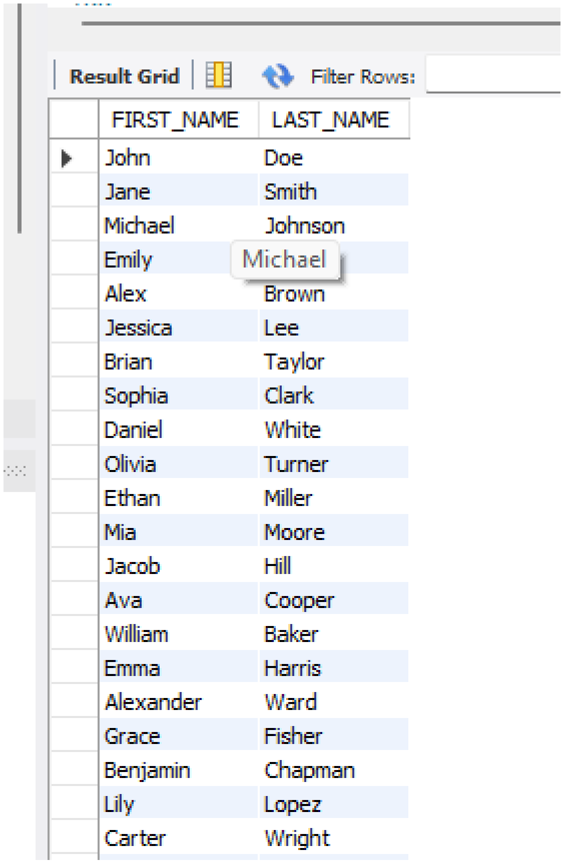
EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
46	Aaliyah	Gibson	66000.00	2025-10-22	IT
5	Alex	Brown	70000.00	2022-05-20	Admin
17	Alexander	Ward	78000.00	2023-05-12	Admin
50	Amelia	Sharp	74000.00	2026-02-20	IT
28	Aria	Wood	69000.00	2024-04-05	Marketing
38	Aubrey	Newton	67000.00	2025-02-20	IT
14	Ava	Cooper	67000.00	2023-02-20	IT
30	Avery	Grant	67000.00	2024-06-18	IT
19	Benjamin	Chapman	71000.00	2023-07-25	Finance
7	Brian	Taylor	72000.00	2022-07-08	Finance
37	Caleb	Mason	72000.00	2025-01-10	Admin
21	Carter	Wright	73000.00	2023-09-03	Admin
22	Chloe	Cooper	68000.00	2023-10-22	IT
9	Daniel	White	60000.00	2022-09-03	Admin
49	Eli	Bennett	71000.00	2026-01-10	Admin
35	Elijah	Perry	77000.00	2024-11-15	Finance
42	Ella	Dixon	68000.00	2025-06-18	IT
4	Emily	Davis	80000.00	2022-04-05	Marketing
16	Emma	Harris	62000.00	2023-04-05	Marketing
11	Ethan	Miller	58000.00	2022-11-15	Finance
33	Gabriel	Barnes	74000.00	2024-09-03	Admin
18	Grace	Fisher	69000.00	2023-06-18	IT
41	Grayson	Hudson	73000.00	2025-05-12	Admin

-- 2 SQL query to fetch the count of employees working in the department ‘Admin’.



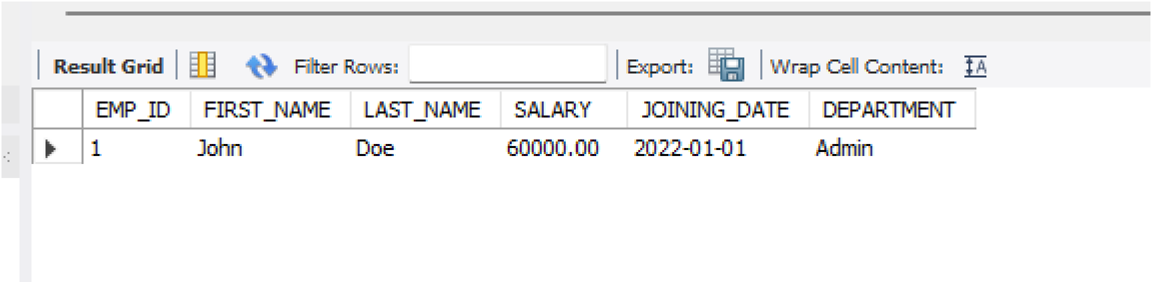
	EmployeeCount
▶	13

-- 3. SQL query to fetch Employee names with salaries >= 50000 and <= 100000.



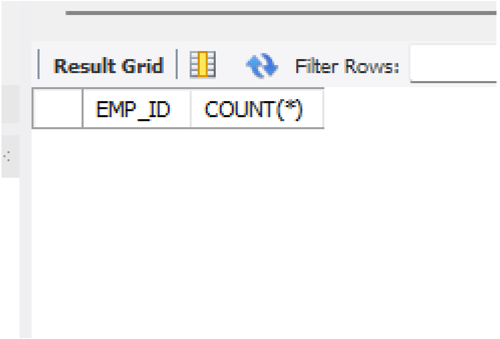
	FIRST_NAME	LAST_NAME
▶	John	Doe
	Jane	Smith
	Michael	Johnson
	Emily	Michael
	Alex	Brown
	Jessica	Lee
	Brian	Taylor
	Sophia	Clark
	Daniel	White
	Olivia	Turner
	Ethan	Miller
	Mia	Moore
	Jacob	Hill
	Ava	Cooper
	William	Baker
	Emma	Harris
	Alexander	Ward
	Grace	Fisher
	Benjamin	Chapman
	Lily	Lopez
	Carter	Wright

-- 4. SQL query to print details of the Workers who are also Managers.



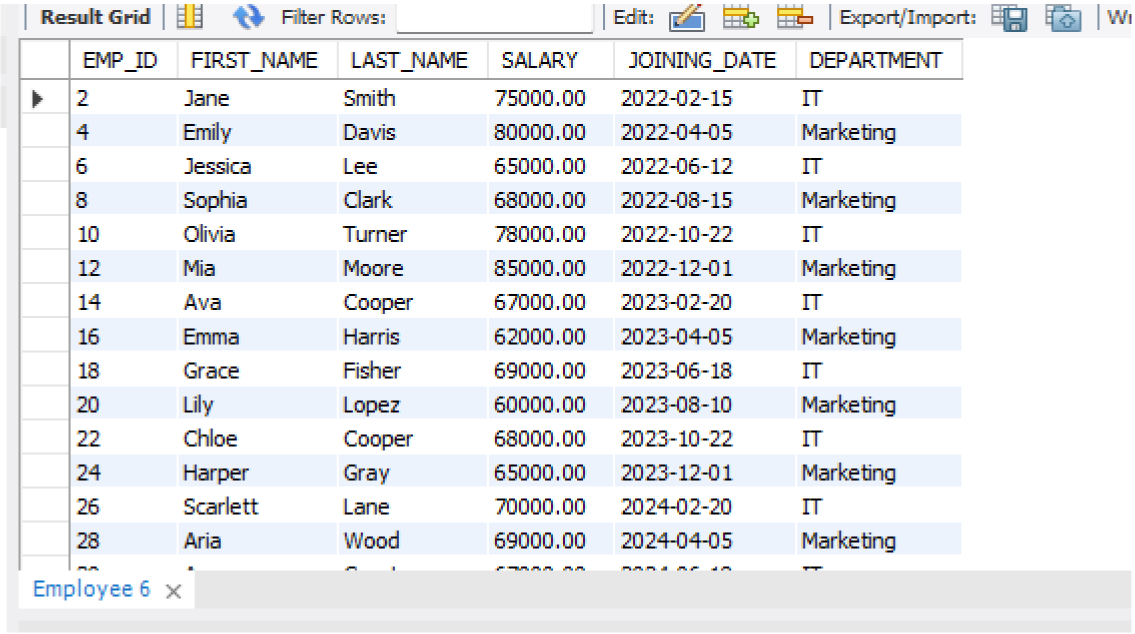
	EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
▶	1	John	Doe	60000.00	2022-01-01	Admin

-- 5. SQL query to fetch duplicate records having matching data in some fields of a table.



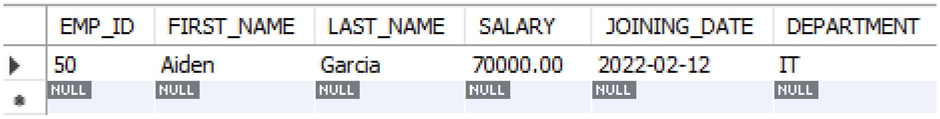
EMP_ID	COUNT(*)

-- 6. SQL query to show only even rows from a table.



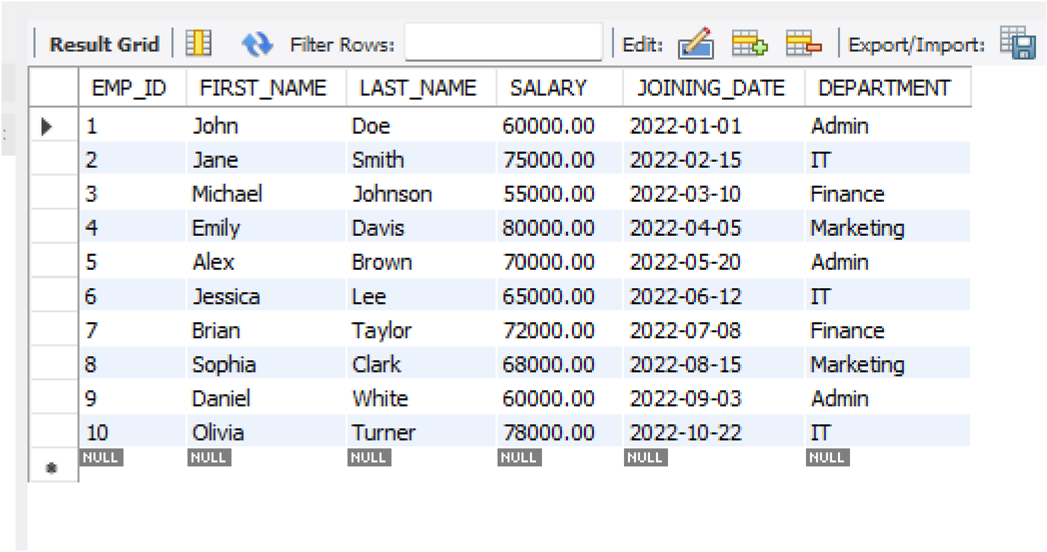
EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
2	Jane	Smith	75000.00	2022-02-15	IT
4	Emily	Davis	80000.00	2022-04-05	Marketing
6	Jessica	Lee	65000.00	2022-06-12	IT
8	Sophia	Clark	68000.00	2022-08-15	Marketing
10	Olivia	Turner	78000.00	2022-10-22	IT
12	Mia	Moore	85000.00	2022-12-01	Marketing
14	Ava	Cooper	67000.00	2023-02-20	IT
16	Emma	Harris	62000.00	2023-04-05	Marketing
18	Grace	Fisher	69000.00	2023-06-18	IT
20	Lily	Lopez	60000.00	2023-08-10	Marketing
22	Chloe	Cooper	68000.00	2023-10-22	IT
24	Harper	Gray	65000.00	2023-12-01	Marketing
26	Scarlett	Lane	70000.00	2024-02-20	IT
28	Aria	Wood	69000.00	2024-04-05	Marketing

-- 7. SQL query to show records from one table that another table does not have. Find employees in employee table that do not exist in bonus table.



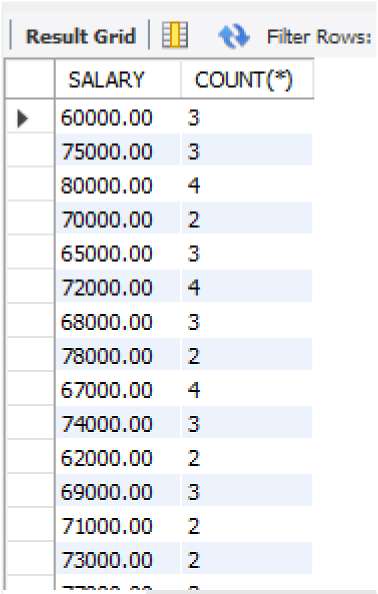
EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
50	Aiden	Garcia	70000.00	2022-02-12	IT
NULL	NULL	NULL	NULL	NULL	NULL

-- 8. SQL query to show the top n (say 10) records of a table.



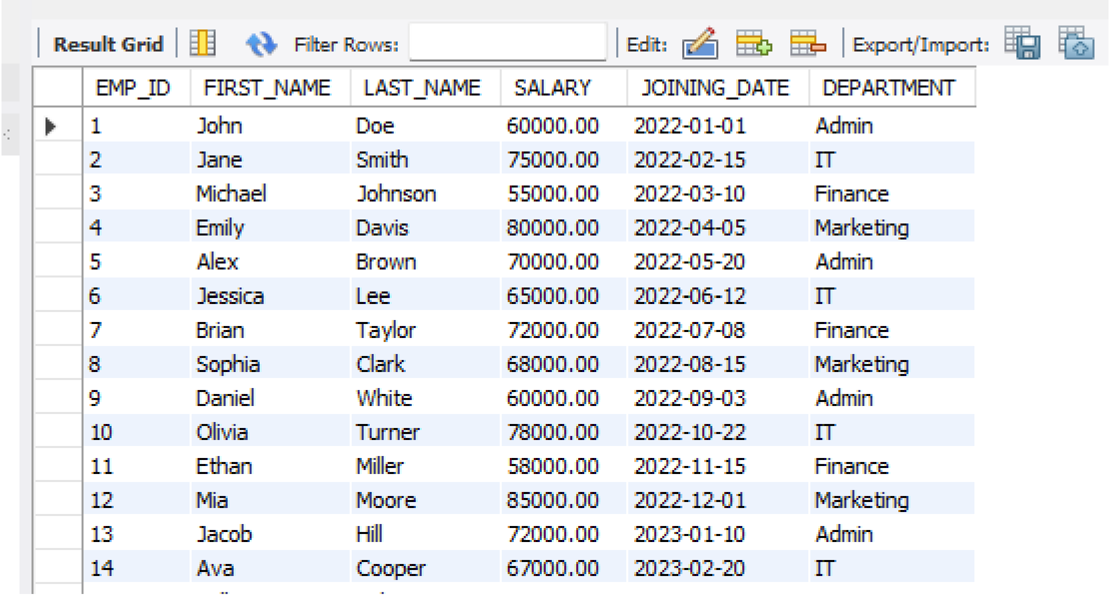
EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
1	John	Doe	60000.00	2022-01-01	Admin
2	Jane	Smith	75000.00	2022-02-15	IT
3	Michael	Johnson	55000.00	2022-03-10	Finance
4	Emily	Davis	80000.00	2022-04-05	Marketing
5	Alex	Brown	70000.00	2022-05-20	Admin
6	Jessica	Lee	65000.00	2022-06-12	IT
7	Brian	Taylor	72000.00	2022-07-08	Finance
8	Sophia	Clark	68000.00	2022-08-15	Marketing
9	Daniel	White	60000.00	2022-09-03	Admin
10	Olivia	Turner	78000.00	2022-10-22	IT
NULL	NULL	NULL	NULL	NULL	NULL

-- 9. Find people who have the same salary.



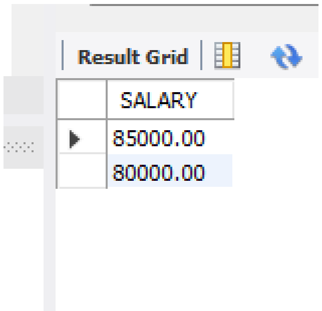
SALARY	COUNT(*)
60000.00	3
75000.00	3
80000.00	4
70000.00	2
65000.00	3
72000.00	4
68000.00	3
78000.00	2
67000.00	4
74000.00	3
62000.00	2
69000.00	3
71000.00	2
73000.00	2
77000.00	2

-- 10. SQL query to fetch the first 50% records from a table.



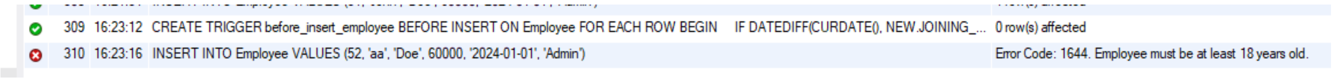
EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
1	John	Doe	60000.00	2022-01-01	Admin
2	Jane	Smith	75000.00	2022-02-15	IT
3	Michael	Johnson	55000.00	2022-03-10	Finance
4	Emily	Davis	80000.00	2022-04-05	Marketing
5	Alex	Brown	70000.00	2022-05-20	Admin
6	Jessica	Lee	65000.00	2022-06-12	IT
7	Brian	Taylor	72000.00	2022-07-08	Finance
8	Sophia	Clark	68000.00	2022-08-15	Marketing
9	Daniel	White	60000.00	2022-09-03	Admin
10	Olivia	Turner	78000.00	2022-10-22	IT
11	Ethan	Miller	58000.00	2022-11-15	Finance
12	Mia	Moore	85000.00	2022-12-01	Marketing
13	Jacob	Hill	72000.00	2023-01-10	Admin
14	Ava	Cooper	67000.00	2023-02-20	IT

-- 11. Find the highest 2 salaries without LIMIT or TOP.



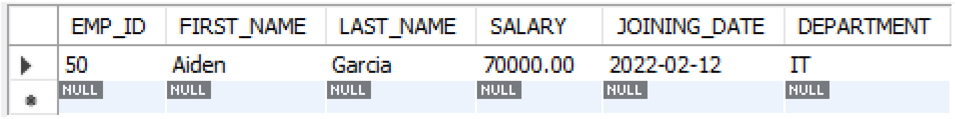
SALARY
85000.00
80000.00

-- 12. Create a trigger to ensure that no employee joining date less than current date can be inserted in the database.



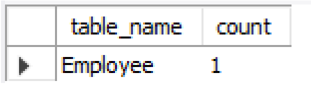
```
309  16:23:12  CREATE TRIGGER before_insert_employee BEFORE INSERT ON Employee FOR EACH ROW BEGIN    IF DATEDIFF(CURDATE(), NEW.JOINING_...  0 row(s) affected
310  16:23:16  INSERT INTO Employee VALUES (52, 'aa', 'Doe', 60000, '2024-01-01', 'Admin')                                          Error Code: 1644. Employee must be at least 18 years old.
```

-- 13. Create a trigger which will work before deletion in employee table and create a duplicate copy of the record in another table employee_backup.



EMP_ID	FIRST_NAME	LAST_NAME	SALARY	JOINING_DATE	DEPARTMENT
50	Aiden	Garcia	70000.00	2022-02-12	IT
NULL	NULL	NULL	NULL	NULL	NULL

-- 14. Create a trigger to count the number of new tuples inserted using each insert statemet



table_name	count
Employee	1

Conclusion:

By organizing data into separate tables and establishing relationships between them using foreign keys, the organization ensures efficient data management and retrieval. The Employee table serves as the central repository for employee information, while the Bonus and Title tables capture additional details related to bonuses and job titles respectively. This structured approach facilitates various queries and analyses, enabling the organization to extract meaningful insights and make informed decisions based on the data stored in the database.

Assignment 2

Aim:

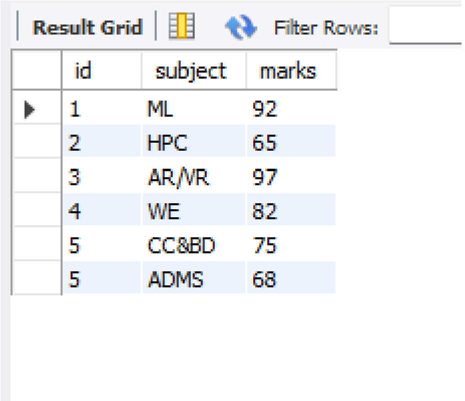
Write a PL/SQL code block to find total and average of 6 subjects and display the grade.

Queries & Output :

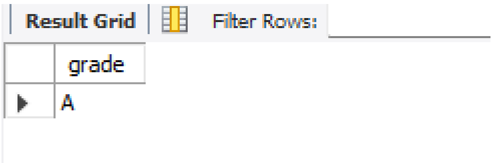
```
CREATE TABLE subjects(
id int,
subject varchar(255),
marks int
);

INSERT INTO subjects(id, subject,marks)
values(1, 'ML',92 ),
(2, 'HPC', 65),
(3, 'AR/VR',97 ),
(4, 'WE', 82 ),
(5, 'CC&BD', 75 ),
(5, 'ADMS', 68 );

CREATE DEFINER=`root`@`localhost` PROCEDURE `Task2`()
begin
declare total_marks int default 0;
declare average_marks int default 0;
declare grade varchar(1);
Select SUM(marks) into total_marks from subjects;
Select AVG(marks) into average_marks from subjects;
if average_marks>=80 then
set grade = 'A';
elseif average_marks>=65 then
set grade = 'B';
elseif average_marks>=50 then
set grade = 'C';
elseif average_marks>=33 then
set grade = 'D';
else
```

```
set grade = 'F';
end if;
select grade;
end
```

OUTPUT:



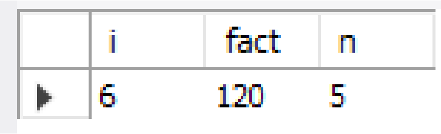
id	subject	marks
1	ML	92
2	HPC	65
3	AR/VR	97
4	WE	82
5	CC&BD	75
5	ADMS	68



grade
A

```
-- Create a stored procedure to calculate factorial
DELIMITER //

 CREATE PROCEDURE facto(IN n INT)
 BEGIN
   DECLARE i INT DEFAULT 1;
   DECLARE fact INT DEFAULT 1;
```

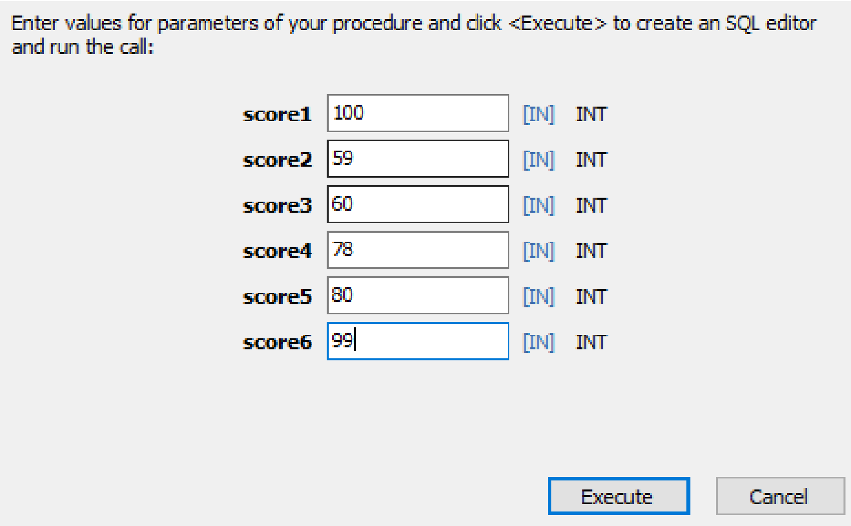
```
  factorial: LOOP
    SET fact = fact * i;
    SET i = i + 1;
    IF i <= n THEN
      ITERATE
    factorial;
    END IF;
    LEAVE factorial;
  END LOOP;

  SELECT i, fact,
n;
END;
//
DELIMITER
;

call studentdata.facto(5);
```



	i	fact	n
▶	6	120	5

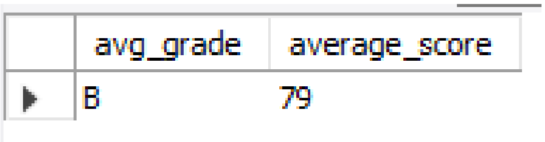
-- Create a stored function to calculate the average grade for 6 subjects

```
DELIMITER //
CREATE PROCEDURE calculate_average_grade(IN score1 INT, IN score2 INT, IN score3
INT, IN score4 INT, IN score5 INT, IN score6 INT)
BEGIN
  DECLARE average_score INT;
  DECLARE total_score INT;
  DECLARE avg_grade
  VARCHAR(10);

  -- Calculate total score
  SET total_score = score1 + score2 + score3 + score4 + score5 + score6;

  -- Calculate average score
  SET average_score = total_score / 6;
  -- Calculate the average grade based on the average score
  IF average_score >= 90 THEN
   SET avg_grade = 'A';
  ELSEIF average_score >= 70 THEN
   SET avg_grade = 'B';
  ELSEIF average_score >= 60 THEN
   SET avg_grade = 'C';
  ELSEIF average_score >= 50 THEN
   SET avg_grade = 'D';
  ELSE
   SET avg_grade = 'E';
  END IF;

  -- Return the average grade
SELECT avg_grade, average_score;
END;
//
DELIMITER
;
```



Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

score1	100	[IN]	INT
score2	59	[IN]	INT
score3	60	[IN]	INT
score4	78	[IN]	INT
score5	80	[IN]	INT
score6	99	[IN]	INT

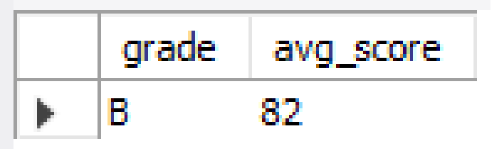


	avg_grade	average_score
▶	B	79

-- Create a stored procedure to calculate average grade from student table

```
DELIMITER //

CREATE PROCEDURE calculate_student_average_grade(IN student_id
INT) BEGIN
  DECLARE score1
  INT; DECLARE
  score2 INT;
  DECLARE score3
  INT; DECLARE
  score4 INT;
  DECLARE score5
  INT; DECLARE
  score6 INT;
  DECLARE average_score INT;
  DECLARE avg_grade
  VARCHAR(10);

  -- Fetch scores for the specified student_id from the student table
  SELECT subject1, subject2, subject3, subject4, subject5, subject6
  INTO score1, score2, score3, score4, score5, score6
  FROM student
  WHERE serial_number = student_id;

  -- Calculate total score
  SET average_score = (score1 + score2 + score3 + score4 + score5 + score6) / 6;

  -- Calculate the average grade based on the average score
  IF average_score >= 90 THEN
    SET avg_grade = 'A';
  ELSEIF average_score >= 70 THEN
    SET avg_grade = 'B';
  ELSEIF average_score >= 60 THEN
    SET avg_grade = 'C';
  ELSEIF average_score >= 50 THEN
    SET avg_grade = 'D';
  ELSE
    SET avg_grade = 'E';
  END IF;

  -- Return the average grade and average score
  SELECT avg_grade AS grade, average_score AS avg_score;
END;
```

```
//
DELIMITER
;

call studentdata.calculate_student_average_grade(2);
```



grade	avg_score
B	82

Conclusion :

Here I learned about how to do a coding in PL/SQL and Using PL/SQL, this code block efficiently calculates the total and average marks, and subsequently assigns a grade based on the calculated average. It's a straightforward approach to automate the grading process for a student's performance in multiple subjects. By encapsulating these calculations within a PL/SQL block, the code offers reusability and maintainability, making it easier to modify or integrate into larger systems as needed.

Assignment 3

Aim:

Consider the following table to write PL/SQL code as specified under
Teacher (t_no, f_name, l_name, salary, supervisor, joining_date, birth_date, title)
Class (class_no, t_no, room_no)
Pay_scale (Min_limit, Max_limit, grade)

1. Accept a range of salary and print the details of teachers from teacher table.
2. By using cursor - Calculate the bonus amount to be given to a teacher depending on the following conditions:
   a) if salary< 10000 then bonus is 10% of the salary.
   b) if salary is between 10000 and 20000 then bonus is 20% of the salary.
   c) if salary is between 20000 and 25000 then bonus is 25% of the salary.
   d) if salary exceeds 25000 then bonus is 30% of the salary.
3. Using a simple LOOP structure, list the first 10 records of the 'teachers' table.
4. Accept the room number and display the teacher details like t_no, f_name, l_name, birth_date, title from table Teacher.

Queries & Output :

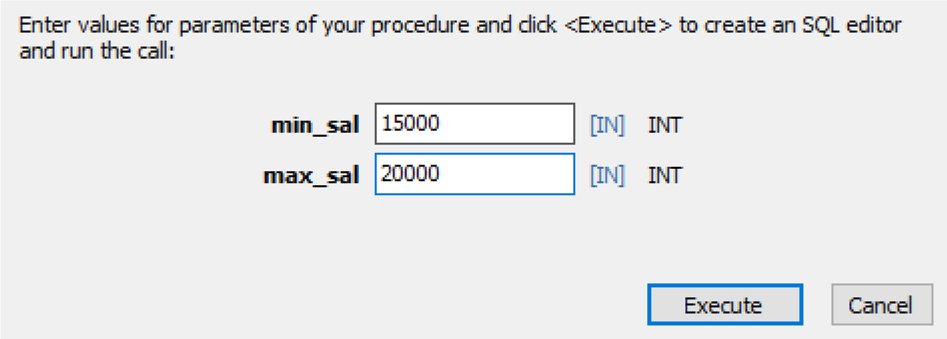
```
create database lab3;
use lab3;

CREATE TABLE Teacher (
   t_no INT PRIMARY KEY,
   f_name VARCHAR(50),
   l_name VARCHAR(50),
   salary DECIMAL(10,2),
   supervisor INT,
   joining_date DATE,
   birth_date DATE,
   title VARCHAR(50)
);

CREATE TABLE Class (
   class_no INT PRIMARY KEY,
   t_no INT,
   room_no INT,
   FOREIGN KEY (t_no) REFERENCES Teacher(t_no)
);

CREATE TABLE Pay_scale (
   grade INT PRIMARY KEY,
   Min_limit DECIMAL(10,2),
   Max_limit DECIMAL(10,2)
);
```

```
INSERT INTO Teacher (t_no, f_name, l_name, salary, supervisor, joining_date, birth_date, title)
VALUES
(1, 'John', 'Doe', 50000, NULL, '2020-01-01', '1985-05-10', 'Math Teacher'),
(2, 'Jane', 'Smith', 55000, 1, '2019-08-15', '1980-12-20', 'Science Teacher'),
(3, 'Alice', 'Johnson', 60000, NULL, '2021-03-10', '1990-03-25', 'English Teacher'),
(4, 'Michael', 'Williams', 52000, 1, '2022-02-20', '1988-07-15', 'History Teacher'),
(5, 'Emily', 'Brown', 58000, NULL, '2020-05-05', '1983-09-30', 'Art Teacher'),
(6, 'David', 'Jones', 53000, 3, '2018-11-11', '1982-11-05', 'Music Teacher'),
(7, 'Sarah', 'Davis', 56000, NULL, '2017-09-01', '1987-06-18', 'Physical Education Teacher'),
(8, 'Christopher', 'Martinez', 59000, 2, '2019-06-30', '1986-04-12', 'Computer Science Teacher'),
(9, 'Jessica', 'Garcia', 54000, NULL, '2021-10-25', '1992-01-28', 'Foreign Language Teacher'),
(10, 'Daniel', 'Rodriguez', 57000, 3, '2016-12-12', '1984-08-22', 'Drama Teacher');

INSERT INTO Class (class_no, t_no, room_no)
VALUES
(101, 1, 101),
(102, 2, 102),
(103, 3, 101),
(104, 4, 104),
(105, 5, 105),
(106, 6, 102),
(107, 7, 103),
(108, 8, 105),
(109, 9, 104),
(110, 10, 106);

INSERT INTO Pay_scale (grade, Min_limit, Max_limit)
VALUES
(1, 40000, 60000),
(2, 60001, 80000),
(3, 80001, 100000),
(4, 100001, 120000),
(5, 120001, 140000),
(6, 140001, 160000),
(7, 160001, 180000),
(8, 180001, 200000),
(9, 200001, 220000),
(10, 220001, 240000);


DELIMITER //

CREATE PROCEDURE PrintTeachersInRange(IN min_salary INT, IN max_salary INT)
BEGIN
  SELECT * FROM Teacher WHERE salary BETWEEN min_salary AND max_salary;
END//

DELIMITER ;
```

```
CREATE PROCEDURE CalculateBonus()
BEGIN
      DECLARE done INT DEFAULT 0;
  DECLARE t_no INT;
  DECLARE salary DECIMAL(10, 2);
  DECLARE bonus DECIMAL(10, 2);
  DECLARE cur CURSOR FOR SELECT t_no, salary FROM Teacher;
  DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = 1;

  OPEN cur;
  read_loop: LOOP
    FETCH cur INTO t_no, salary;
    IF done THEN
      LEAVE read_loop;
    END IF;

    IF salary < 10000 THEN
      SET bonus = salary * 0.1;
    ELSEIF salary BETWEEN 10000 AND 20000 THEN
      SET bonus = salary * 0.2;
    ELSEIF salary BETWEEN 20000 AND 25000 THEN
      SET bonus = salary * 0.25;
    ELSE
      SET bonus = salary * 0.3;
    END IF;

    -- Output the result
    SELECT CONCAT('Teacher with ID ', t_no, ' has a bonus of ', bonus) AS result;
  END LOOP;

  CLOSE cur;
END
DELIMITER //



CREATE PROCEDURE ListFirst10Teachers()
BEGIN
  DECLARE counter INT DEFAULT 0;
  DECLARE t_no INT;
  DECLARE f_name VARCHAR(50);
  DECLARE l_name VARCHAR(50);
  DECLARE birth_date DATE;
  DECLARE title VARCHAR(50);
  DECLARE cur CURSOR FOR SELECT t_no, f_name, l_name, birth_date, title FROM Teacher
LIMIT 10; -- Limit the result to the first 10 records
  DECLARE CONTINUE HANDLER FOR NOT FOUND SET counter = 10;

  OPEN cur;
  read_loop: LOOP
```

```
        FETCH cur INTO t_no, f_name, l_name, birth_date, title;
        IF counter >= 10 THEN
            LEAVE read_loop;
        END IF;
        -- Output the result directly
        SELECT CONCAT('Teacher ', t_no, ': ', f_name, ' ', l_name, ', Birth Date: ', birth_date, ', Title: ', title) AS result;
        SET counter = counter + 1;
    END LOOP;
    CLOSE cur;
END //
```

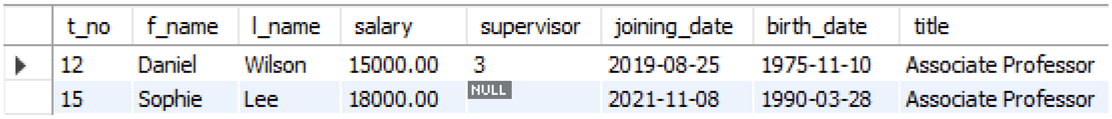
-- Task 1: Accept a range of salary and print details of teachers from the teacher table.



Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

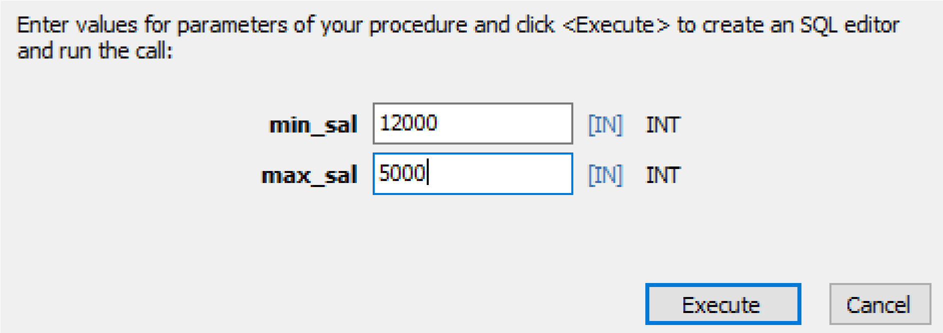
min_sal 15000 [IN] INT

max_sal 20000 [IN] INT



t_no	f_name	l_name	salary	supervisor	joining_date	birth_date	title
12	Daniel	Wilson	15000.00	3	2019-08-25	1975-11-10	Associate Professor
15	Sophie	Lee	18000.00	NULL	2021-11-08	1990-03-28	Associate Professor

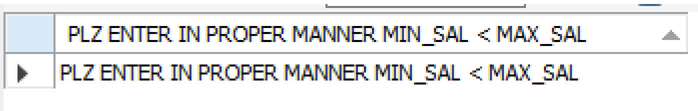
Figure shows a Procedure of 1 output and input



Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

min_sal 12000 [IN] INT

max_sal 5000 [IN] INT



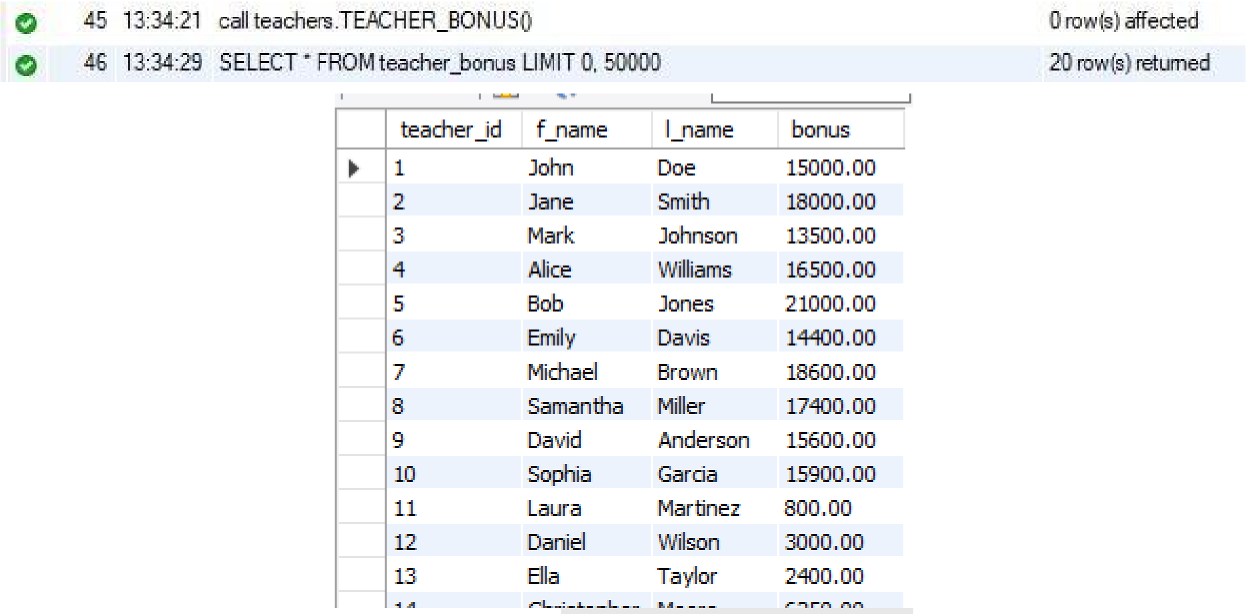
```
PLZ ENTER IN PROPER MANNER MIN_SAL < MAX_SAL
PLZ ENTER IN PROPER MANNER MIN_SAL < MAX_SAL
```

Figure shows a Procedure of 1 output and input wrong input

```
-- Task 2: Calculate the bonus amount using a cursor
DELIMITER //
CREATE PROCEDURE TEACHER_BONUS()
BEGIN
    -- Declare variables to store fetched data
```

```
DECLARE v_teacher_id INT;
DECLARE v_f_name VARCHAR(250);
DECLARE v_l_name VARCHAR(250);
DECLARE v_salary DECIMAL(10, 2);
DECLARE v_bonus DECIMAL(10, 2);

-- Declare cursor
DECLARE    Teach_Bonus    CURSOR
   FOR  SELECT  t_no,  f_name,  l_name,
   salary FROM teacher;

-- Declare handler for NOT FOUND condition
DECLARE CONTINUE HANDLER FOR NOT FOUND
   SET v_teacher_id = NULL;

-- Create a new table to store bonus values
CREATE TABLE IF NOT EXISTS teacher_bonus
(
   teacher_id INT PRIMARY KEY,
   f_name VARCHAR(250),
   l_name VARCHAR(250),
   bonus DECIMAL(10, 2)
);

-- Open the cursor
OPEN Teach_Bonus;

-- Fetch and process data from the cursor
FETCH Teach_Bonus INTO v_teacher_id, v_f_name, v_l_name, v_salary;

-- Loop through the cursor results
WHILE v_teacher_id IS NOT NULL
DO
   -- Calculate bonus based on salary conditions
   IF v_salary < 10000 THEN
      SET v_bonus = 0.10 * v_salary;
   ELSEIF v_salary BETWEEN 10000 AND 20000 THEN
      SET v_bonus = 0.20 * v_salary;
   ELSEIF v_salary BETWEEN 20000 AND 25000 THEN
      SET v_bonus = 0.25 * v_salary;
   ELSE
      SET v_bonus = 0.30 * v_salary;
   END IF;
```

```
        -- Insert the calculated bonus into the new table
        INSERT INTO teacher_bonus (teacher_id, f_name, l_name, bonus)
        VALUES (v_teacher_id, v_f_name, v_l_name, v_bonus);

        -- Fetch the next row
        FETCH Teach_Bonus INTO v_teacher_id, v_f_name, v_l_name, v_salary;
    END WHILE;

    -- Close the cursor
    CLOSE Teach_Bonus;
END //
DELIMITER
;
CALL TEACHER_BONUS();
SELECT * FROM teacher_bonus;
```



```
45  13:34:21  call teachers.TEACHER_BONUS()                         0 row(s) affected
46  13:34:29  SELECT * FROM teacher_bonus LIMIT 0, 50000             20 row(s) returned
```

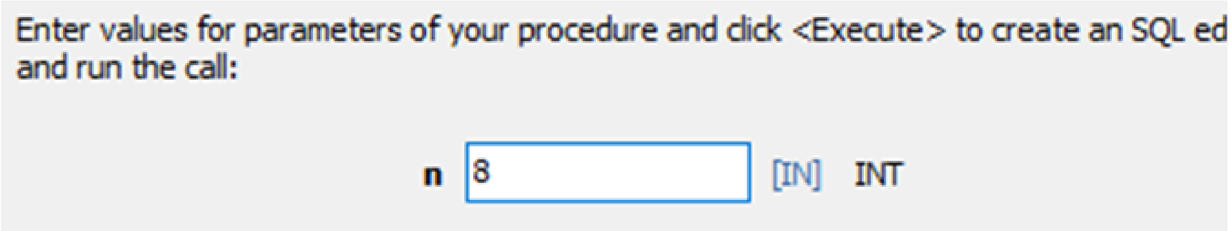
teacher_id	f_name	l_name	bonus
1	John	Doe	15000.00
2	Jane	Smith	18000.00
3	Mark	Johnson	13500.00
4	Alice	Williams	16500.00
5	Bob	Jones	21000.00
6	Emily	Davis	14400.00
7	Michael	Brown	18600.00
8	Samantha	Miller	17400.00
9	David	Anderson	15600.00
10	Sophia	Garcia	15900.00
11	Laura	Martinez	800.00
12	Daniel	Wilson	3000.00
13	Ella	Taylor	2400.00
14	Christopher	Moore	6250.00

Figure shows a Procedure of 2 output

```
-- Task 3: Using a simple LOOP structure, list the first 10 records of the 'teachers' table.
DELIMITER //

CREATE PROCEDURE TEACHER_RECORD(IN n
INT) BEGIN
    DECLARE v_t_no INT;
    DECLARE v_f_name VARCHAR(250);
    DECLARE v_l_name VARCHAR(250);
    DECLARE v_salary DECIMAL(10, 2);
    DECLARE v_supervisor BOOL;
```

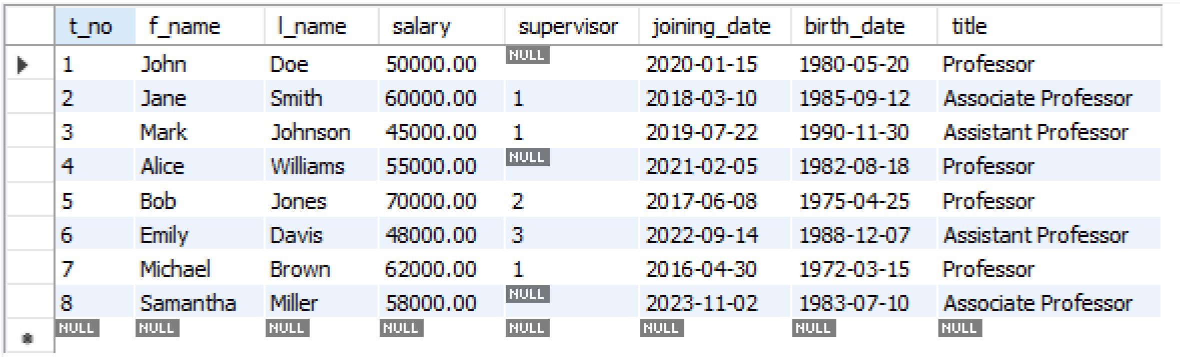
```
  DECLARE v_joining_date DATE;
  DECLARE v_birth_date DATE;
  DECLARE v_title
  VARCHAR(50); DECLARE c
  INTEGER;

  DECLARE Teach_REC CURSOR FOR
            SELECT t_no, f_name, l_name, salary, supervisor, joining_date, birth_date, title
    FROM teacher;

  DECLARE CONTINUE HANDLER FOR NOT FOUND
            SET v_t_no = NULL;
      SET c = 1;

  CREATE TABLE IF NOT EXISTS TRECORDS (
    t_no int primary key,
            f_name varchar(255),
            l_name varchar(255),
            salary
            DECIMAL(10,2),
            supervisor INT,
            joining_date date,
            birth_date date,
            title varchar(50)
  );

  OPEN Teach_REC;
            FETCH Teach_REC INTO
v_t_no,v_f_name,v_l_name,v_salary,v_supervisor,v_joining_date,v_birth_date,v_title;

            WHILE c <= n
            DO
                  INSERT TRECORDS (t_no, f_name, l_name, salary, supervisor,
joining_date, birth_date, title)
                  VALUES
(v_t_no,v_f_name,v_l_name,v_salary,v_supervisor,v_joining_date,v_birth_date,v_title);
                  FETCH Teach_REC INTO
v_t_no,v_f_name,v_l_name,v_salary,v_supervisor,v_joining_date,v_birth_date,v_title;
                  SET c = c + 1;
    END WHILE;
  CLOSE Teach_REC;
END //
```

```
DELIMITER ;

SELECT * FROM TRECORDS;
```



Enter values for parameters of your procedure and click <Execute> to create an SQL ed
and run the call:

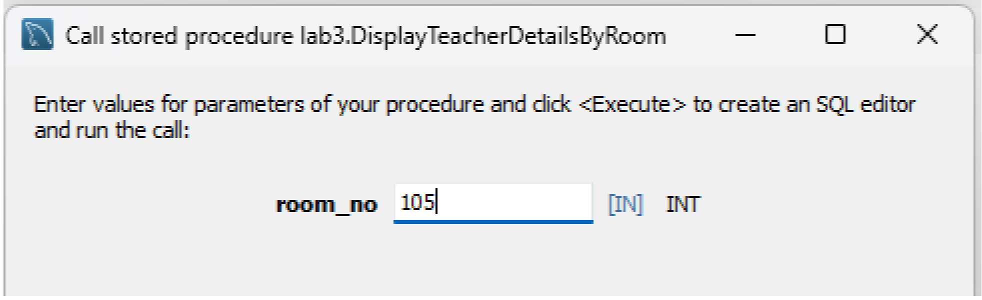
n 8 [IN] INT



t_no	f_name	l_name	salary	supervisor	joining_date	birth_date	title
1	John	Doe	50000.00	NULL	2020-01-15	1980-05-20	Professor
2	Jane	Smith	60000.00	1	2018-03-10	1985-09-12	Associate Professor
3	Mark	Johnson	45000.00	1	2019-07-22	1990-11-30	Assistant Professor
4	Alice	Williams	55000.00	NULL	2021-02-05	1982-08-18	Professor
5	Bob	Jones	70000.00	2	2017-06-08	1975-04-25	Professor
6	Emily	Davis	48000.00	3	2022-09-14	1988-12-07	Assistant Professor
7	Michael	Brown	62000.00	1	2016-04-30	1972-03-15	Professor
8	Samantha	Miller	58000.00	NULL	2023-11-02	1983-07-10	Associate Professor
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

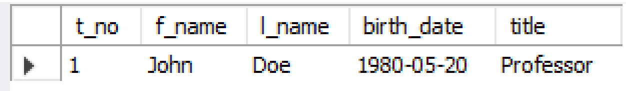
Figure shows a Procedure of 3 input output

```
-- Task 4: Accept the room number and display teacher details.
DELIMITER //
CREATE PROCEDURE TEACHER_ROOMNO(IN room_number INT )
BEGIN
	IF room_number >= 201 AND room_number <= 220 then
		select Teacher.t_no, Teacher.f_name, Teacher.l_name, Teacher.birth_date, Teacher.title from Teacher join Class on Teacher.t_no = Class.t_no where room_number = Class.room_no ;
	ELSE
		select "Enter room number between 201 and 220";
	END IF;
END;
//

DELIMITER ;
```



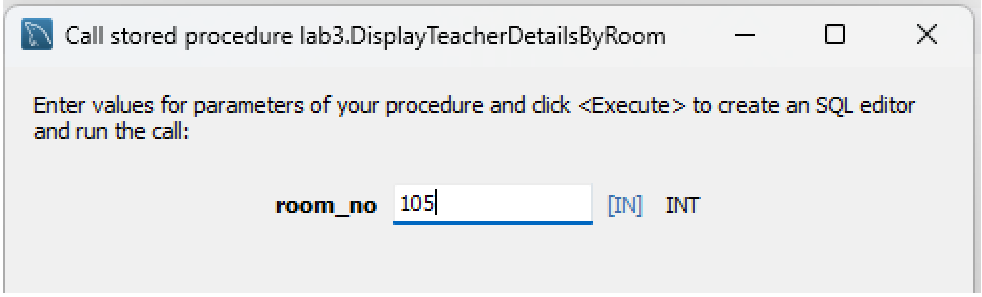
Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

room_no 105 [IN] INT



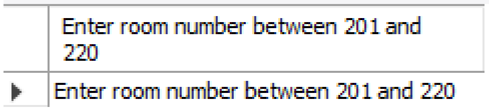
t_no	f_name	l_name	birth_date	title
1	John	Doe	1980-05-20	Professor

Figure shows a Procedure of 4 input output



Enter values for parameters of your procedure and click <Execute> to create an SQL editor and run the call:

room_no 105 [IN] INT



Enter room number between 201 and 220
Enter room number between 201 and 220

Figure shows a Procedure of 4 output when user enter wrong input

Conclusion :

I acquired the skills to create a producer using PL/SQL and gained knowledge in utilizing cursors within a program. Specifically, I developed a teacher database as part of the assignment, successfully completing the task. This experience allowed me to familiarize myself with various PL/SQL commands.

Assignment 4

Aim:

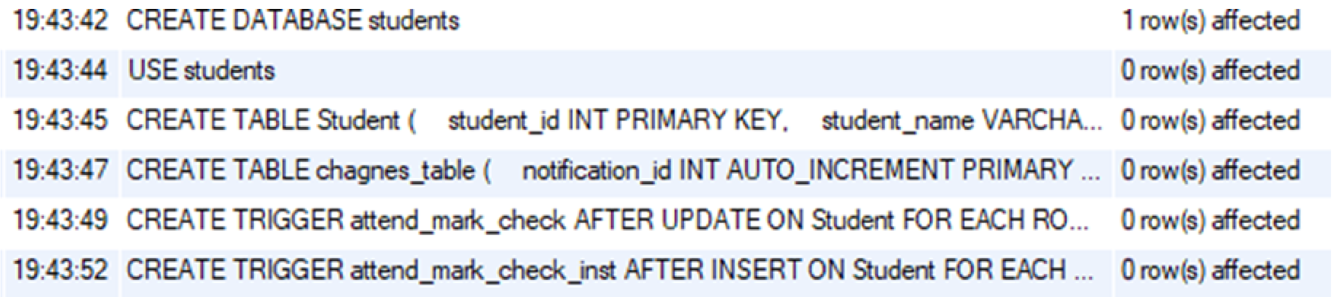
Design and develop a suitable Student Database application. One of the attributes to me maintained is the attendance of a student in each subject for which he/she has enrolled.
Using TRIGGERS, we write active rules to do the following:

a) Whenever attendance is updated, check if the attendance is less than 85%; if so notify the Head of Department concerned.
b) Whenever the marks in the Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

Queries:

```
create database lab4;
use lab4;


CREATE TABLE marks (
   sname VARCHAR(10) PRIMARY KEY,
   m1 INTEGER,
   m2 INTEGER,
   m3 INTEGER,
   m4 INTEGER,
   m5 INTEGER,
   m6 INTEGER
);

INSERT INTO marks VALUES ('Ankit', 10, 10, 10, 10, 10, 10);
INSERT INTO marks VALUES ('Dev', 11, 11, 11, 11, 11, 11);
INSERT INTO marks VALUES ('Preet', 20, 11, 18, 17, 10, 11);



DELIMITER $$
CREATE TRIGGER marks_check_trigger BEFORE INSERT ON marks
FOR EACH ROW
BEGIN
   DECLARE minimum_percentage INT DEFAULT 40;
   DECLARE max_marks INT DEFAULT 100; -- Assuming maximum marks

   IF NEW.m1 < max_marks * minimum_percentage / 100 THEN
      SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M1';
   END IF;

   IF NEW.m2 < max_marks * minimum_percentage / 100 THEN
      SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M2';
   END IF;

   IF NEW.m3 < max_marks * minimum_percentage / 100 THEN
```

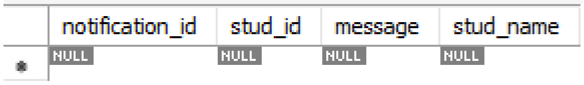
```
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M3';
    END IF;

    IF NEW.m4 < max_marks * minimum_percentage / 100 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M4';
    END IF;

    IF NEW.m5 < max_marks * minimum_percentage / 100 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M5';
    END IF;

    IF NEW.m6 < max_marks * minimum_percentage / 100 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Marks less than 40% in M6';
    END IF;
END$$
DELIMITER ;


insert into marks values('Darshan',20,60,55,77,88,99);
insert into marks values('Chirag',20,60,55,77,88,99);






CREATE TABLE attendance (
    sname VARCHAR(10) PRIMARY KEY,
    att1 INTEGER,
    att2 INTEGER,
    att3 INTEGER,
    att4 INTEGER,
    att5 INTEGER,
    att6 INTEGER
);


INSERT INTO attendance VALUES ('Ankit', 10, 10, 10, 10, 10, 10);
INSERT INTO attendance VALUES ('Dev', 11, 11, 11, 11, 11, 11);
INSERT INTO attendance VALUES ('Darshan', 10, 11, 8, 7, 10, 11);

DELIMITER $$
CREATE DEFINER = CURRENT_USER TRIGGER `lab4`.`attendance_AFTER_UPDATE` AFTER UPDATE
ON `attendance` FOR EACH ROW
BEGIN
    DECLARE total_classes INTEGER;

    SET total_classes := 50; -- Change the total_classes value as per your requirement

    IF NEW.att1 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 1';
    END IF;

    IF NEW.att2 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 2';
    END IF;

    IF NEW.att3 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 3';
    END IF;

    IF NEW.att4 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 4';
    END IF;

    IF NEW.att5 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 5';
    END IF;

    IF NEW.att6 / total_classes * 100 < 85 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Attendance less than 85% in Subject 6';
    END IF;
END$$
DELIMITER ;


UPDATE attendance
SET att1 = 53
WHERE sname = 'Ankit';

UPDATE attendance
SET att1 = 153
WHERE sname = 'Dev';

 UPDATE attendance SET att1=46,att2=45,att3=47,att4=48,att5=49,att6=473 WHERE sname='Darshan';
```



```
19:43:42  CREATE DATABASE students                                                          1 row(s) affected
19:43:44  USE students                                                                      0 row(s) affected
19:43:45  CREATE TABLE Student (     student_id INT PRIMARY KEY,     student_name VARCHA...  0 row(s) affected
19:43:47  CREATE TABLE chagnes_table (     notification_id INT AUTO_INCREMENT PRIMARY ...   0 row(s) affected
19:43:49  CREATE TRIGGER attend_mark_check AFTER UPDATE ON Student FOR EACH RO...           0 row(s) affected
19:43:52  CREATE TRIGGER attend_mark_check_inst AFTER INSERT ON Student FOR EACH ...        0 row(s) affected
```

Figure 4.1 shows above queries are successfully executed

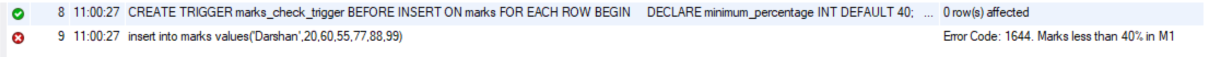
select * from chagnes_table;



```
   notification_id  stud_id  message  stud_name
*  NULL             NULL     NULL     NULL
```

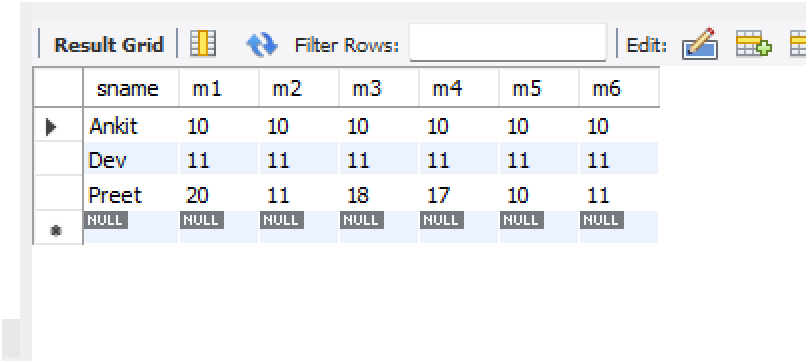
Figure 4.2 null table

```
INSERT INTO Student (student_id, student_name, adm43_marks, adm43_attendance)
VALUES
(1, 'John Doe', 85, 76),
(2, 'Jane Smith', 78, 82),
(3, 'Alice Johnson', 90, 85),
(4, 'Bob Williams', 82, 79),
(5, 'Emily Brown', 88, 92),
(6, 'Michael Davis', 76, 84),
(7, 'Sophia Wilson', 85, 91),
(8, 'William Martinez', 92, 88),
(9, 'Olivia Anderson', 79, 91),
(10, 'Daniel Taylor', 91, 88);

select * from chagnes_table;
```



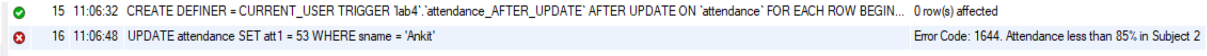
```
✓ 8 11:00:27 CREATE TRIGGER marks_check_trigger BEFORE INSERT ON marks FOR EACH ROW BEGIN    DECLARE minimum_percentage INT DEFAULT 40;  ...  0 row(s) affected
✗ 9 11:00:27 insert into marks values('Darshan',20,60,55,77,88,99)                                                                       Error Code: 1644. Marks less than 40% in M1
```

Figure 4.3 changes by insertion trigger



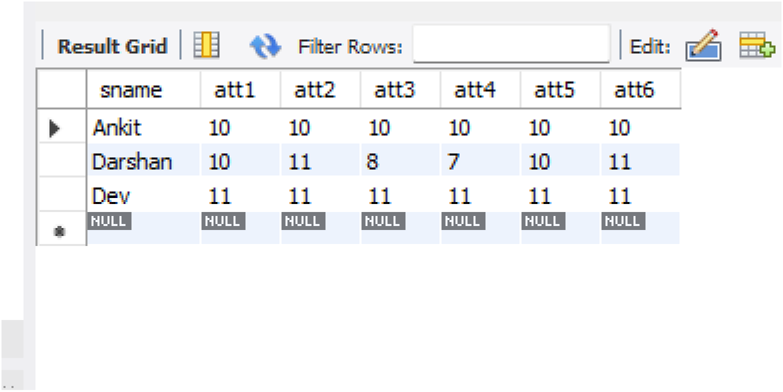
	sname	m1	m2	m3	m4	m5	m6
▶	Ankit	10	10	10	10	10	10
	Dev	11	11	11	11	11	11
	Preet	20	11	18	17	10	11
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 4.4 student table



```
15 11:06:32 CREATE DEFINER = CURRENT_USER TRIGGER `lab4`.`attendance_AFTER_UPDATE` AFTER UPDATE ON `attendance` FOR EACH ROW BEGIN...   0 row(s) affected
16 11:06:48 UPDATE attendance SET att1 = 53 WHERE sname = 'Ankit'                                                                       Error Code: 1644. Attendance less than 85% in Subject 2
```

Figure 4.5 changes in table as updation happen as compare to fig 4.3



sname	att1	att2	att3	att4	att5	att6
Ankit	10	10	10	10	10	10
Darshan	10	11	8	7	10	11
Dev	11	11	11	11	11	11
NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 4.6 changes in student table as updation happen as compare to fig 4.4 and also value updated in table as well as in changes table.

Conclusion:

Through the use of PL/SQL, these tasks are accomplished efficiently, leveraging the power of cursors, loops, and conditional statements. By organizing and processing data stored in the "Teacher" table, the code provides valuable insights such as teacher salary details, bonus calculations, and specific teacher information based on room numbers. This enables effective management and analysis of teacher-related data within the database system.

Assignment 5

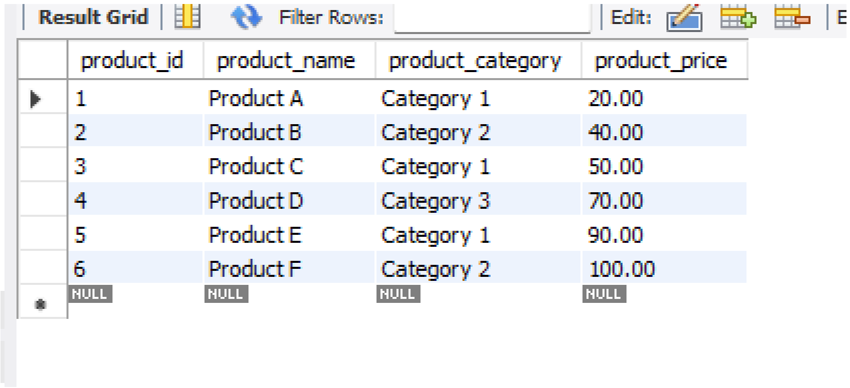
Aim:

How to analyze ecommerce Inventory

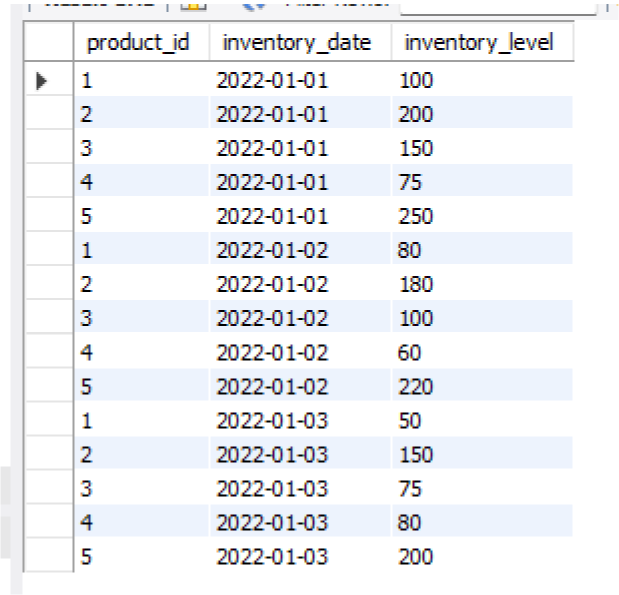
1. What are the top 5 products with the highest inventory levels on the most recent inventory date ?
2. What is the total inventory level for each product category on the most recent inventory date ?
3. What is the average inventory level for each product category for the month of January 2022 ?
4. Which products had a decrease in inventory level from the previous inventory date to the current inventory date ?
5. What is the overall trend in inventory levels for each product category over the month of January 2022 ?

Code :

```
CREATE DATABASE lab5;

use lab5;

CREATE TABLE products (
product_id SERIAL PRIMARY KEY,
product_name VARCHAR(50),
product_category VARCHAR(20),
product_price NUMERIC(10,2)
);

INSERT INTO products (product_name, product_category, product_price)
VALUES ('Product A', 'Category 1', 20),
('Product B', 'Category 2', 40),
('Product C', 'Category 1', 50),
('Product D', 'Category 3', 70),
('Product E', 'Category 1', 90),
('Product F', 'Category 2', 100);

CREATE TABLE inventory (
  product_id INT,
  inventory_date DATE,
  inventory_level INT
);


INSERT INTO inventory (product_id, inventory_date, inventory_level)
VALUES (1, '2022-01-01', 100),
      (2, '2022-01-01', 200),
      (3, '2022-01-01', 150),
      (4, '2022-01-01', 75),
      (5, '2022-01-01', 250),
      (1, '2022-01-02', 80),
      (2, '2022-01-02', 180),
      (3, '2022-01-02', 100),
      (4, '2022-01-02', 60),
      (5, '2022-01-02', 220),
      (1, '2022-01-03', 50),
      (2, '2022-01-03', 150),
      (3, '2022-01-03', 75),
      (4, '2022-01-03', 80),
      (5, '2022-01-03', 200);
```



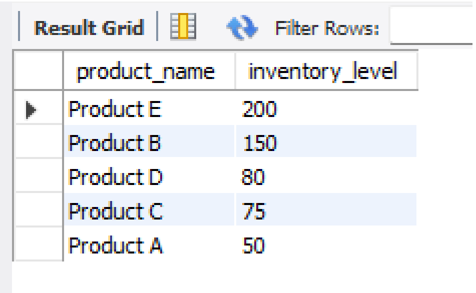
product_id	product_name	product_category	product_price
1	Product A	Category 1	20.00
2	Product B	Category 2	40.00
3	Product C	Category 1	50.00
4	Product D	Category 3	70.00
5	Product E	Category 1	90.00
6	Product F	Category 2	100.00
NULL	NULL	NULL	NULL



product_id	inventory_date	inventory_level
1	2022-01-01	100
2	2022-01-01	200
3	2022-01-01	150
4	2022-01-01	75
5	2022-01-01	250
1	2022-01-02	80
2	2022-01-02	180
3	2022-01-02	100
4	2022-01-02	60
5	2022-01-02	220
1	2022-01-03	50
2	2022-01-03	150
3	2022-01-03	75
4	2022-01-03	80
5	2022-01-03	200

1) What are the top 5 products with the highest inventory levels on the most recent inventory date ?

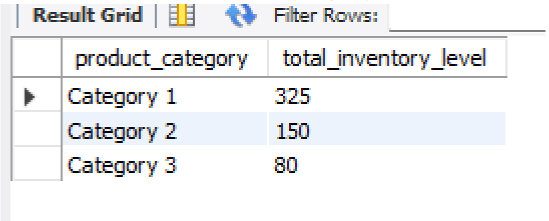
```
SELECT p.product_name, i.inventory_level FROM products p
JOIN inventory i ON p.product_id = i.product_id
WHERE i.inventory_date = (SELECT MAX(inventory_date) FROM inventory)
ORDER BY i.inventory_level DESC
LIMIT 5;
```



product_name	inventory_level
Product E	200
Product B	150
Product D	80
Product C	75
Product A	50

2) What is the total inventory level for each product category on the most recent inventory date ?

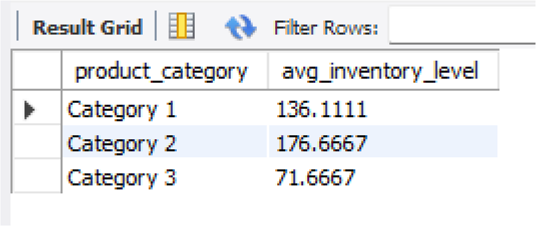
```
SELECT p.product_category, SUM(i.inventory_level) AS total_inventory_level FROM products p
JOIN inventory i ON p.product_id = i.product_id
WHERE i.inventory_date = (SELECT MAX(inventory_date) FROM inventory)
GROUP BY p.product_category;
```



product_category	total_inventory_level
Category 1	325
Category 2	150
Category 3	80

3) What is the average inventory level for each product category for the month of January 2022 ?

```
SELECT p.product_category, AVG(i.inventory_level) AS
avg_inventory_level FROM products p
JOIN inventory i ON p.product_id = i.product_id
WHERE i.inventory_date >= '2022-01-01' AND i.inventory_date < '2022-02-01'
GROUP BY p.product_category;
```

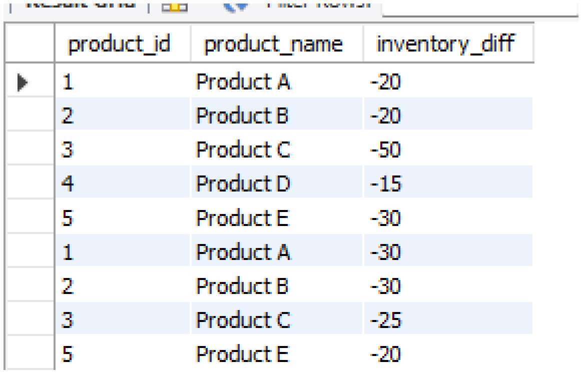


product_category	avg_inventory_level
Category 1	136.1111
Category 2	176.6667
Category 3	71.6667

4) Which products had a decrease in inventory level from the previous inventory date to the current inventory date ?

```
SELECT i1.product_id, p.product_name, i1.inventory_level - i2.inventory_level AS inventory_diff
FROM inventory i1
JOIN inventory i2 ON i1.product_id = i2.product_id AND i1.inventory_date = DATE_ADD(i2.inventory_date,
INTERVAL 1 DAY)
JOIN products p ON i1.product_id = p.product_id
```

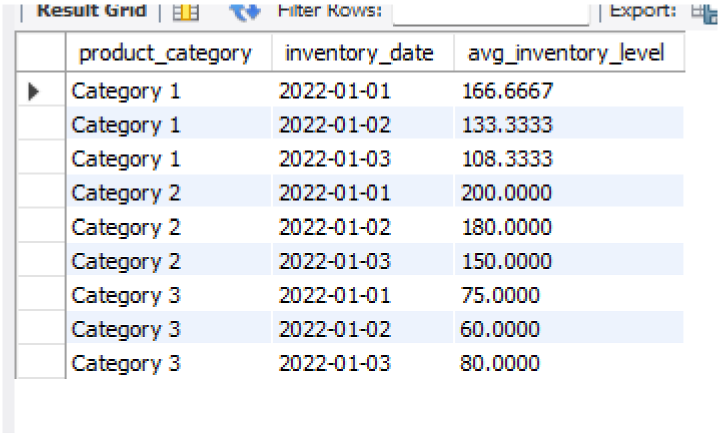
```
WHERE i1.inventory_level < i2.inventory_level;
```



	product_id	product_name	inventory_diff
▶	1	Product A	-20
	2	Product B	-20
	3	Product C	-50
	4	Product D	-15
	5	Product E	-30
	1	Product A	-30
	2	Product B	-30
	3	Product C	-25
	5	Product E	-20

5) What is the overall trend in inventory levels for each product category over the month of January 2022 ?

```
SELECT p.product_category, i.inventory_date, AVG(i.inventory_level) AS avg_inventory_level
FROM products p
JOIN inventory i ON p.product_id = i.product_id
WHERE i.inventory_date >= '2022-01-01' AND i.inventory_date < '2022-02-01'
GROUP BY p.product_category, i.inventory_date
ORDER BY p.product_category, i.inventory_date;
```



	product_category	inventory_date	avg_inventory_level
▶	Category 1	2022-01-01	166.6667
	Category 1	2022-01-02	133.3333
	Category 1	2022-01-03	108.3333
	Category 2	2022-01-01	200.0000
	Category 2	2022-01-02	180.0000
	Category 2	2022-01-03	150.0000
	Category 3	2022-01-01	75.0000
	Category 3	2022-01-02	60.0000
	Category 3	2022-01-03	80.0000

Conclusion: In analyzing ecommerce inventory using MySQL queries, insights were gained on top products by inventory, total inventory per category, and average levels for January 2022. Identification of products with decreased inventory highlighted management areas. Trend analysis for January 2022 revealed patterns, aiding in proactive adjustments. Leveraging MySQL for ecommerce inventory analysis enabled actionable insights for optimizing stock levels and improving business performance.

Assignment 6

Aim:

(Object Oriented)

A) Write a PL/SQL code to create a class for a "Person" with attributes such as name, age, and address.

B) Write a PL/SQL code to Implement methods in the "Person" class to display the details and update the age.

C) Write a PL/SQL code to implement a method to calculate the annual bonus based on the salary in the "Employee" class.

D) Write a PL/SQL code to create a "Manager" subclass inheriting from the "Employee" class, and add an attribute to store the number of employees managed.

Code:

1) **Write a PL/SQL code to create a class for a "Person" with attributes such as name, age, and address.**

```
CREATE TYPE Person AS OBJECT (

name  VARCHAR2(50),

age    NUMBER,

address VARCHAR2(100)

);


DECLARE

p1 Person;

BEGIN

p1 := Person(‘Ankit', 30, 'Surat');

DBMS_OUTPUT.PUT_LINE('Name: ' || p1.name);

DBMS_OUTPUT.PUT_LINE('Age: ' || p1.age);

DBMS_OUTPUT.PUT_LINE('Address: ' || p1.address);
END;
```

2) **Write a PL/SQL code to Implement methods in the "Person" class to display the details and update the age.**

```
CREATE OR REPLACE TYPE Person AS OBJECT (
id      NUMBER,
name VARCHAR2(100),
age    NUMBER,



CREATE OR REPLACE TYPE BODY Person AS
MEMBER FUNCTION displayDetails RETURN VARCHAR2 IS BEGIN
RETURN 'Person ID: ' || self.id || ', Name: ' || self.name || ', Age: '
self.age; END;
MEMBER PROCEDURE updateAge(newAge NUMBER) IS BEGIN
self.age := newAge; END;
END;

CREATE OR REPLACE PACKAGE PersonPackage AS
FUNCTION displayDetails(p Person) RETURN VARCHAR2;
PROCEDURE updateAge(p IN OUT Person, newAge NUMBER);


END;

CREATE OR REPLACE PACKAGE BODY PersonPackage AS
FUNCTION displayDetails(p Person) RETURN VARCHAR2 IS
BEGIN
RETURN p.displayDetails();
END;

PROCEDURE updateAge(p IN OUT Person, newAge NUMBER) IS BEGIN
```

```
p.updateAge(newAge);
END;
END;

DECLARE
p1 Person := Person(1, 'Ankit', 30);
p2 Person := Person(2, 'Bhavik', 25);
BEGIN
DBMS_OUTPUT.PUT_LINE(PersonPackage.displayDetails(p1));
DBMS_OUTPUT.PUT_LINE(PersonPackage.displayDetails(p2));
PersonPackage.updateAge(p1, 31);
DBMS_OUTPUT.PUT_LINE('After updating age:');
DBMS_OUTPUT.PUT_LINE(PersonPackage.displayDetails(p1));
DBMS_OUTPUT.PUT_LINE(PersonPackage.displayDetails(p2));
END;
```

3) **Write a PL/SQL code to implement a method to calculate the annual bonus based on the salary in the "Employee" class.**

```
CREATE OR REPLACE TYPE Employee AS OBJECT ( emp_id NUMBER,
emp_name VARCHAR2(100),
salary NUMBER,
MEMBER FUNCTION calculate_bonus RETURN NUMBER
);
CREATE OR REPLACE TYPE BODY Employee AS
MEMBER FUNCTION calculate_bonus RETURN NUMBER IS


bonus_percentage NUMBER;
```

```
bonus_amount NUMBER;
BEGIN
IF self.salary < 50000 THEN
bonus_percentage := 0.1;
ELSIF self.salary < 100000 THEN
bonus_percentage := 0.15;
ELSE
bonus_percentage := 0.2;
END IF;

bonus_amount := self.salary * bonus_percentage;

RETURN bonus_amount;
END;
END;
DECLARE
emp_obj Employee;
emp_bonus NUMBER;
BEGIN
emp_obj := Employee(1, 'Ankit', 65000);
emp_bonus := emp_obj.calculate_bonus;
DBMS_OUTPUT.PUT_LINE('Employee Bonus: ' || emp_bonus); END;
```

4) **Write a PL/SQL code to create a "Manager" subclass inheriting from the "Employee" class, and add an attribute to store the number of employees managed.**

```
CREATE OR REPLACE TYPE Employee AS OBJECT ( emp_id NUMBER,
emp_name VARCHAR2(100),
salary NUMBER
NOT FINAL;

CREATE OR REPLACE TYPE Manager UNDER Employee (
number_of_employees NUMBER
);

CREATE TABLE employees_data OF Employee
INSERT INTO employees_data VALUES (1, 'Ankit', 150000)
INSERT INTO employees_data VALUES (2, 'Bhavik', 80000)
INSERT INTO employees_data VALUES (3, 'Dev', 120000)

CREATE TABLE managers_data OF Manager
INSERT INTO managers_data VALUES (4, 'Ankit', 150000, 10)
DECLARE
emp_data Employee;
mgr_data Manager;
BEGIN
FOR emp_data IN (SELECT * FROM employees_data) LOOP
DBMS_OUTPUT.PUT_LINE('Employee ID: ' || emp_data.emp_id || ', Name: '
emp_data.emp_name || ', Salary: ' || emp_data.salary);
END LOOP;

FOR mgr_data IN (SELECT * FROM managers_data) LOOP
DBMS_OUTPUT.PUT_LINE('Manager ID: ' || mgr_data.emp_id || ', Name: '
mgr_data.emp_name || ', Salary: ' || mgr_data.salary || ', Number of Employees: ' ||
mgr_data.number_of_employees);
```

```
END LOOP; END;
```

Output:

1)

```
Type created.
Statement processed.
Name: Ankit
 Age: 21

Address: IIIT SURAT
```

2)

```
Type created.
Type created.
Statement processed.
Person ID: 1, Name: Ankit, Age:
20 Person ID: 2, Name: Bhavik,
Age: 28
Updated age:
Person ID: 1, Name: Ankit, Age:
25 Person ID: 2, Name: Bhavik,
Age: 28
```

3)

```
Type created.

 Type created.
 Statement processed.

Employee Bonus: 9750
```

4)

```
 Type created.
 Type created.
Type created.

Type created.

 Statement processed.
 Employee Bonus: 4000

 Statement processed.
 Manager Bonus: 16275
```

Conclusion:

This PL/SQL code demonstrates the principles of object-oriented programming within the context of Oracle Database. By defining classes and subclasses, along with methods to operate on their attributes, we establish a foundation for modeling complex real-world entities and their behaviors. Such an approach promotes code reusability, modularity, and maintainability, allowing for the creation of scalable and robust database applications. Through these examples, we showcase how to structure and extend classes to encapsulate data and behavior, thereby enabling efficient and organized development within the Oracle PL/SQL environment.

Assignment 7

Aim:

1. Write a SQL statement to create a simple table countries including columns country_id,country_name and region_id.
2. Write a SQL statement to create a simple table countries including columns country_id,country_name and region_id which already exist.
3. Write a SQL statement to create the structure of a table dup_countries similar to countries.
4. Write a SQL statement to create a duplicate copy of countries table including structure and data by name dup_countries.
5. Write a SQL statement to create a table countries set a constraint NULL.
6. Write a SQL statement to create a table named jobs including columns job_id, job_title, min_salary, max_salary and check whether the max_salary amount exceeding the upper limit 25000.
7. Write a SQL statement to create a table named countries including columns country_id, country_name and region_id and make sure that no countries except Italy, India and China will be entered in the table.
8. Write a SQL statement to create a table named countries including columns country_id,country_name and region_id and make sure that no duplicate data against column country_id will be allowed at the time of insertion.
9. Write a SQL statement to create a table named jobs including columns job_id, job_title, min_salary and max_salary, and make sure that, the default value for job_title is blank and min_salary is 8000 and max_salary is NULL will be entered automatically at the time of insertion if no value assigned for the specified columns.
10. Write a SQL statement to create a table named countries including columns country_id, country_name and region_id and make sure that the country_id column will be a key field which will not contain any duplicate data at the time of insertion.
11. Write a SQL statement to create a table countries including columns country_id, country_name and region_id and make sure that the column country_id will be unique and store an auto-incremented value.

Click me to see the solution

12. Write a SQL statement to create a table countries including columns country_id, country_name and region_id and make sure that the combination of columns country_id and region_id will be unique.

Code :

```
CREATE DATABASE AS7;
USE AS7;

-- 1. Create a simple table countries
CREATE TABLE AS7.countries (
    country_id INT,
    country_name VARCHAR(50),
    region_id INT
);

-- 2. Create a table countries if not exists
CREATE TABLE IF NOT EXISTS AS7.countries (
    country_id INT,
    country_name VARCHAR(50),
    region_id INT
);

-- 3. Create the structure of table dup_countries similar to countries
CREATE TABLE AS7.dup_countries LIKE AS7.countries;

-- 4. Create a duplicate copy of countries table including structure and data
CREATE TABLE AS7.dup_countries AS SELECT * FROM AS7.countries;

-- 5. Create a table countries with a constraint allowing NULL values
CREATE TABLE AS7.countries (
    country_id INT,
    country_name VARCHAR(50),
    region_id INT,
    CONSTRAINT country_name_null CHECK (country_name IS NULL)
);

-- 6. Create a table jobs with max_salary check constraint
CREATE TABLE AS7.jobs (
    job_id INT,
    job_title VARCHAR(50),
    min_salary DECIMAL(10,2),
    max_salary DECIMAL(10,2),
    CONSTRAINT max_salary_check CHECK (max_salary <= 25000)
);

-- 7. Create a table countries with specific allowed country entries
CREATE TABLE AS7.countries (
   country_id INT,
   country_name VARCHAR(50),
   region_id INT,
   CONSTRAINT country_name_check CHECK (country_name IN ('Italy', 'India', 'China'))
);

-- 8. Create a table countries with no duplicate country_id allowed
CREATE TABLE AS7.countries (
   country_id INT PRIMARY KEY,
   country_name VARCHAR(50),
   region_id INT
);

-- 9. Create a table jobs with default values for specified columns
CREATE TABLE AS7.jobs (
   job_id INT,
   job_title VARCHAR(50) DEFAULT '',
   min_salary DECIMAL(10,2) DEFAULT 8000,
   max_salary DECIMAL(10,2)
);

-- 10. Create a table countries with country_id as a key field
CREATE TABLE AS7.countries (
   country_id INT UNIQUE,
   country_name VARCHAR(50),
   region_id INT
);

-- 11. Create a table countries with auto-incremented country_id and unique constraint
CREATE TABLE AS7.countries (
   country_id INT AUTO_INCREMENT PRIMARY KEY,
   country_name VARCHAR(50),
   region_id INT,
   UNIQUE(country_id)
);

-- 12. Create a table countries with unique combination of country_id and region_id
CREATE TABLE AS7.countries (
   country_id INT,
   country_name VARCHAR(50),
   region_id INT,
   UNIQUE(country_id, region_id)
)
```

Conclusion:

Creating tables in PostgreSQL involves careful consideration of data structure and integrity constraints to ensure efficient data storage and retrieval. These SQL statements showcase various scenarios encountered during table creation, demonstrating PostgreSQL's versatility and robustness in handling diverse database requirements. With PostgreSQL's rich feature set and SQL support, database administrators can design and manage databases effectively, facilitating the development of reliable and scalable applications.