OBJECTIVES:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.
- To familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented framework
- To give a good formal foundation on the relational model of data
- To present SQL and procedural interfaces to SQL comprehensively
- To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

OUTCOMES:

•Understand,appreciate and effectively explain the underlying concepts of database technologies.

- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-artRDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors.
- Design and build a GUI application using a 4GL

List of Experiments:

SQL

1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
2. Queries using operators in SQL
3. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
4. Queries using Group By, Order By, and Having Clauses
5. Queries on Controlling Data: Commit, Rollback, and Save point
6. Queries to Build Report in SQL *PLUS
7. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints

8. Queries on Joins and Correlated Sub-Queries

9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features

PL/SQL

10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment Operation

11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL

12. Write a PL/SQL block using SQL and Control Structures in PL/SQL

13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types

14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS

15. Write a PL/SQL Code Creation of forms for any Information System such as Student
Information System, Employee Information System etc. 18

16. Demonstration of database connectivity

SQL
1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.

SQL FUNCTIONS:
SQL Functions are used to perform m calculations on data. Manipulate output from groups of rows. It can also format date members for display. It can also used for modifying individual data items. SQL function sometimes takes arguments and always returns value.
There are two distinct types of functions:

1. Single Row functions

2. Multiple Row functions

Single Row functions:
Single row functions operate on single rows only and return one result per row.
The different type single row functions are

1. Character functions

2. Number Functions
3. Date functions.
4. Conversion Function
5. General Function

1 .Character Functions:

Upper	Returns char with all letters into upper case
lower	Converts the mixed case or uppercase character strings to lowercase
Initcap	Converts the first letter of each word to upper case and remaining letters to lowercase
Concat	Joins values together you are limited to two arguments with concat
Substr	This extracts a string of determined length
Length	Shows the length of a string as a numeric value
Instr	Finds numeric position of named character
Lpad	Pads the character value right justified
Rpad	Pads the character value left justified
Trim	Trims heading or trailing characters from a character string
Raplace	To replace a set of character (String based)
Translate	Change a character to a new described character(character based)

```
SQL> select upper ('oracle') "UPPER" from dual;
UPPER
------
ORACLE
```

```
SQL> select lower ('ORACLE') "LOWER" from dual;
```

```
LOWER
------
Oracle

SQL> select initcap('sql functions') "initcap" from dual;
initcap
-------------
Sql Functions

SQL> select concat('sql','functions') from dual;
    CONCAT('SQL'
    ------------
    Sqlfunctions

    SQL> select substr('sqlfunctions',1,5) from dual;
    SUBST
    -----
    sqlfu

    SQL> select substr('sqlfunctions',2,5) from dual;
    SUBST
    -----
    qlfun
    SQL> select substr('sqlfunctions',4,5) from dual;
    SUBST
    -----
    funct

    SQL> select length('sqlfunctions') from dual;

    LENGTH('SQLFUNCTIONS')
    ----------------------
                        12




    SQL> select instr('sqlfunctions','f') from dual;
    INSTR('SQLFUNCTIONS','F')
    -------------------------
                            4
    SQL> select lpad(sal,15,'*') from emp;
    LPAD(SAL,15,'*'
    ---------------
    ************800
    ***********1600
```

```
***********1250
***********2975
***********1250
***********2850
***********2450
***********3000
***********5000
***********1500
***********1100
************950
***********3000
***********1300

SQL> select rpad(sal,15,'*') from emp;
RPAD(SAL,15,'*'
---------------
800************
1600***********
1250***********
2975***********
1250***********
2850***********
2450***********
3000***********
5000***********
1500***********
1100***********
950************
3000***********
1300***********


SQL> select trim('s' from 'ssmiths') from dual;
TRIM
----
mith
SQL> select ltrim('ssmiths','s') from dual;
LTRIM
-----
miths

SQL> select rtrim('ssmiths','s') from dual;
RTRIM(
------
ssmith
SQL> select replace('jack and jue','j','bl') from dual;
```

```
REPLACE('JACKA
--------------
black and blue
SQL> select translate('jack','j','b') from dual;
TRAN
----BACK
```

<u>Number Functions:</u>

Round	Rounds the value to specified decimal
Trunc	Truncates the column, expression, or value to n decimal places
Power	Calculates the power of the given value
Mod	Finds the remainder of value1 divided by value1
Ceil	Takes the height decimal value
Floor	Takes the lowest decimal value

```
SQL> select round(35.823,2), round(35.823,0), round(35.823,-1) from dual;
ROUND(35.823,2) ROUND(35.823,0) ROUND(35.823,-1)
--------------- --------------- ----------------
          35.82              36               40

SQL> select trunc(35.823,2), trunc(35.823), trunc(35.823,-2) from dual;
TRUNC(35.823,2) TRUNC(35.823) TRUNC(35.823,-2)
--------------- ------------- ----------------
          35.82            35                0

SQL> select mod(5,2) from dual;
  MOD(5,2)
----------
         1

SQL> select mod(sal,2000) from emp where job like 'SALESMAN';
MOD(SAL,2000)
-------------
         1600
         1250
         1250
         1500
SQL> select sal from emp where job like 'SALESMAN';
       SAL
----------
      1600
      1250
      1250
      1500

SQL> select ceil(35.23), ceil(35.5), ceil(35.6) from dual;

CEIL(35.23) CEIL(35.5) CEIL(35.6)
----------- ---------- ----------
         36         36         36

SQL> select floor(35.23), floor(35.5), floor(35.6) from dual;

FLOOR(35.23) FLOOR(35.5) FLOOR(35.6)
------------ ----------- -----------
          35          35          35
```

Date Functions:

SYSDATE is a pseudo column that returns the current date and time. When we select sysdate it will display in a dummy table called DUAL. Oracle date range between 1st jan 4712 BC and 31st Dec 4712 AD.

Months_between	It returns the numeric value. Finds the no. of months between date1 and date2, result may be positive or negative.
Add_months	It returns the date datatype. Adds n number of calendar months to date, n must be an integer and it can be negative
Last_day	It returns the date datatype. Date of the
Next_day	It returns the date datatype. Date of the next specified day of the week following date1, char may be number representing a day, or a character

```
SQL> select sysdate from dual;

SYSDATE
---------
08-JUL-10

SQL> select months_between(sysdate, hiredate) from emp;

MONTHS_BETWEEN(SYSDATE,HIREDATE)
--------------------------------
            354.728983
            352.632208
            352.567692
            351.212854
            345.374144
            350.245112
            348.987047
            278.664466
            343.728983
                   346
            277.535434
            343.180596
            343.180596
            341.535434

14 rows selected.

SQL> select months_between('01-jan-2010', sysdate) from dual;
MONTHS_BETWEEN('01-JAN-2010',SYSDATE)
-------------------------------------
               -6.2451325

SQL> select last_day(sysdate) from dual;
LAST_DAY(
---------
31-JUL-10
```

```
SQL> select last_day(hiredate),last_day('15-feb-88') from emp;
LAST_DAY( LAST_DAY(
--------- ---------
31-DEC-80 29-FEB-88
28-FEB-81 29-FEB-88
28-FEB-81 29-FEB-88
30-APR-81 29-FEB-88
30-SEP-81 29-FEB-88
31-MAY-81 29-FEB-88
30-JUN-81 29-FEB-88
30-APR-87 29-FEB-88
30-NOV-81 29-FEB-88
30-SEP-81 29-FEB-88
31-MAY-87 29-FEB-88
31-DEC-81 29-FEB-88
31-DEC-81 29-FEB-88
31-JAN-82 29-FEB-88
```

Sunday	1
Monday	2
Tuesday	3
Wednesday	4
Thursday	5
Friday	6
Saturday	7

```
SQL> select last_day(hiredate),last_day('15-feb-88') from emp;
LAST_DAY( LAST_DAY(
--------- ---------
31-DEC-80 29-FEB-88
28-FEB-81 29-FEB-88
28-FEB-81 29-FEB-88
30-APR-81 29-FEB-88
30-SEP-81 29-FEB-88
31-MAY-81 29-FEB-88
30-JUN-81 29-FEB-88
30-APR-87 29-FEB-88
30-NOV-81 29-FEB-88
30-SEP-81 29-FEB-88
31-MAY-87 29-FEB-88
31-DEC-81 29-FEB-88
31-DEC-81 29-FEB-88
31-JAN-82 29-FEB-88
```

```
14 rows selected.
```

```
SQL> select next_day(sysdate, 'friday') from dual;
NEXT_DAY(
---------
09-JUL-10
```

```
SQL> select next_day(hiredate,'friday'), next_day(hiredate,6) from emp where deptno=10;
NEXT_DAY( NEXT_DAY(
--------- ---------
12-JUN-81 12-JUN-81
20-NOV-81 20-NOV-81
29-JAN-82 29-JAN-82
```

Month mid value	1-15
Day mid value	Sunday
Year mid value	30-jun

```
SQL> select round(sysdate,'day') from dual;
ROUND(SYS
---------
11-JUL-10

SQL> select round(sysdate,'year') from dual;
ROUND(SYS
---------
01-JAN-11

SQL> select round(sysdate,'month') from dual;
ROUND(SYS
---------
01-JUL-10

SQL> select trunc(sysdate,'month'), trunc(sysdate,'year') from dual;
TRUNC(SYS TRUNC(SYS
--------- ---------
01-JUL-10 01-JAN-10
```

Conversion Functions:

To_char(number | date,['fmt']	Converts numbers or date to character format fmt
To_number(char)	Converts char, which contains a number to a NUBER
To_date	Converts the char value representing date, into a date value according to fmt specified. If fmt is omitted, format is DD-MM-YYYY

```
SQL> select to_char(3000, '$9999.99') from dual;
TO_CHAR(3
---------
 $3000.00

SQL> select to_char(sysdate, 'fmday, ddth month yyyy') from dual;
TO_CHAR(SYSDATE,'FMDAY,DDTHMON
-----------------------------
thursday, 8th july 2010

SQL> select to_char(sysdate, 'hh:mi:ss') from dual;
TO_CHAR(
--------
03:04:27

SQL> select to_char(sal,'$9999.99') from emp;
TO_CHAR(S
---------
  $800.00
 $1600.00
 $1250.00
 $2975.00
 $1250.00
 $2850.00
 $2450.00
 $3000.00
 $5000.00
 $1500.0
0
 $1100.00
  $950.00
 $3000.00
 $1300.00

SQL> select empno,ename, job,sal from emp where sal>to_number('1500');
    EMPNO ENAME      JOB              SAL
---------- ---------- --------- ----------
     7499 ALLEN      SALESMAN        1600
     7566 JONES      MANAGER         2975
     7698 BLAKE      MANAGER         2850
     7782 CLARK      MANAGER        2450
     7788 SCOTT      ANALYST        3000
     7839 KING       PRESIDENT      5000
     7902 FORD       ANALYST        3000

SQL> update emp set hiredate=to_date('1998 05 20', 'yyyy mm dd') where ename='SMITH';

1 row updated.
```

General Functions:

Uid	This function returns the integer value corresponding to the user currently logged in
User	This function returns the login user name, which is in varchar2 datatype
Nvl	This function is used in case where we want to consider null values
Vsize	This function returns the number of bytes in the expression, if expression is null it returns zero.
Case	Case expression let you use IF-THEN-ELSE logic in SQL statements without having invoke procedures
Decode	Decodes and expression in a way similar IF-THEN-ELSE logic. Decodes and expression after comparing it to each search value.

```
SQL> select uid from dual;
       UID
----------
        59

SQL> select user from dual;
USER
------------------------------
SCOTT

SQL>  select ename, nvl(comm,0) from emp;
ENAME      NVL(COMM,0)
---------- -----------
SMITH               0
ALLEN             300
WARD              500
JONES               0
MARTIN           1400
BLAKE               0
CLARK               0
SCOTT               0
KING                0
```

```
TURNER             0
ADAMS              0
JAMES              0
FORD               0
MILLER             0

SQL> select vsize('hello') from dual;
VSIZE('HELLO')
--------------
             5

SQL> select vsize(ename) from emp;
VSIZE(ENAME)
------------
           5
           5
           4
           5
           6
           5
           5
           5
           4
           6
           5
           5
           4
           6

SQL> select ename,job,sal ,
  case job when 'CLERK' then 1.10*sal
    when 'MANAGER' then 1.15*sal
    else sal end "revised salary" from emp;

ENAME      JOB              SAL revised salary
---------- --------- ---------- --------------
SMITH      CLERK            800            880
ALLEN      SALESMAN        1600           1600
WARD       SALESMAN        1250           1250
JONES      MANAGER         2975        3421.25
MARTIN     SALESMAN        1250           1250
BLAKE      MANAGER         2850         3277.5
CLARK      MANAGER         2450         2817.5
SCOTT      ANALYST         3000           3000
KING       PRESIDENT       5000           5000
TURNER     SALESMAN        1500           1500
ADAMS      CLERK           1100           1210
JAMES      CLERK            950           1045
FORD       ANALYST         3000           3000
MILLER     CLERK           1300           1430
```

```
SQL> select ename,job,sal ,
  decode(job,'CLERK',1.10*sal,'MANAGER',1.15*sal,'SALESMAN',1.20*sal,sal) "revised salary" from
emp;

ENAME      JOB             SAL revised salary
---------- --------- ---------- --------------
SMITH      CLERK           800            880
ALLEN      SALESMAN       1600           1920
WARD       SALESMAN       1250           1500
JONES      MANAGER        2975        3421.25
MARTIN     SALESMAN       1250           1500
BLAKE      MANAGER        2850         3277.5
CLARK      MANAGER        2450         2817.5
SCOTT      ANALYST        3000           3000
KING       PRESIDENT      5000           5000
TURNER     SALESMAN       1500           1800
ADAMS      CLERK          1100           1210
JAMES      CLERK           950           1045
FORD       ANALYST        3000           3000
MILLER     CLERK          1300           1430
```

Multiple Row functions:

A group function returns a result based on a group of rows. Some of these are just purely mathematical functions. This group function operate on sets of rows of rows to give one result per group. These sets may be the whole table or the table split into groups.

Sum	To obtain the sum of a range of values of a record set
Avg	This function will return the average of values of the column specified in the argument of column
Min	This function will give the least value of all values of the column present in the argument.
Max	This function will give the maximum value of all values of the column present in the argument.
Count	This function will return the number of rows contained to the related column

```
SQL> select sum(sal) from emp;
  SUM(SAL)
----------
     29025U

SQL> select avg(Sal) from emp;
  AVG(SAL)
----------
2073.21429
```

```
SQL> select min(sal) from emp;
  MIN(SAL)
----------
       800

SQL> select max(sal) from emp;
  MAX(SAL)
----------
      5000

SQL> select count(*) from emp;
  COUNT(*)
----------
        14
```

2.Queries using operators in SQL

FIND THOSE EMPLOYEES WHOSE COMMISSION IS GREATER THAN THEIR SALARY.

```
SQL>  SELECT ENO,ENAME,SAL,COMM  FROM EMP WHERE SAL<NVL(COMM,0);

                ENO    ENAME      SAL       COMM
                ------ ---------- ---------- ----------
               7654   MARTIN     1252       1400
```

DISPLAY THOSE EMPLOYEES WHOSE SALARY IS BETWEEN 1000 AND 2000.

```
SQL> SELECT * FROM EMP WHERE SAL BETWEEN 1000 AND 2000;

               ENO   ENAME  JOB  MGR  HIREDATE SAL     COMM    DNO
               ----- -----  --- ---  -------- ----     ----    ----
               7654  MARTIN SALESMAN 7698 28-SEP-81    1252     1400
               7499  ALLEN  SALESMAN 7698 20-FEB-81    1602      300
```

LIST ALL EMPLOYEES WHOSE NAME WITH S.

```
SQL> SELECT * FROM EMP WHERE ENAME LIKE 'S%';

               ENO ENAME  JOB MGR HIREDATE  SAL COMM  DNO
               --- -----  --- --- --------- --- ----  ---
              7369 SMITHH  CLERK 7902 17-DEC-80   802   20     200
               7788 SCOTT   ANALYST7566 09-DEC-82  102   20     300
```

LIST ALL EMPLOYEES WHO HAVE NAME EXACTLY 4 CHARACTERS IN LENGTH.

```
SQL> SELECT ENO,ENAME FROM EMP WHERE  LENGTH(RTRIM(ENAME))=4;

        ENO       ENAME
        ---------- ----------
        7839      KING
        7521      WARD
        7902      FORD
```

3. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update

1) Find the names of sailors who have reserved boat number 103.

```
SQL> select s.sname from sailors s, reserves r where s.sid=r.sid and r.bid=103;

SNAME
--------------------------------------------------
DUSTIN
LUBBER
HORATIO
```

2) Find the names of sailors who have reserved a red boat.

```
SQL> select distinct s.sname from sailors s,reserves r, boats b where s.sid=r.sid and r.bid=b.bid and
b.color='RED';

SNAME
--------------------------------------------------
DUSTIN
DUSTIN
LUBBER
LUBBER
HORATIO
```

3) Find the names and ages of all sailors;

```
SQL> select sname, age from sailors;

SNAME                                              AGE
-------------------------------------------------- ----------
DUSTIN                                             45
BRUTUS                                             33
LUBBER                                           55.5
ANDY                                             25.5
RUSTY                                              35
HORATIO                                            35
ZORBA                                              16
HORATIO                                            35
ART                                              25.5
BOB                                              63.5
```

```
10 rows selected.

SQL> select distinct s.sname, s.age from sailors s;
```
/* With distinct clause /*

```
SNAME                                              AGE
-------------------------------------------------- ----------
ANDY                                              25.5
ART                                               25.5
BOB                                               63.5
BRUTUS                                              33
DUSTIN                                              45
HORATIO                                             35
LUBBER                                            55.5
RUSTY                                               35
ZORBA                                               16
```

4) Find all sailors with a rating above 7

```
SQL> select s.sid,s.sname,s.rating,s.age from sailors s  where s.rating>7;

       SID SNAME                                              RATING        AGE
---------- -------------------------------------------------- ---------- ----------
        31 LUBBER                                                  8       55.5
        32 ANDY                                                    8       25.5
        58 RUSTY                                                  10         35
        71 ZORBA                                                  10         16
        74 HORATIO                                                 9         35
```

5) Find the names of boats reserved by lubber

```
SQL> select b.color from sailors s, boats b, reserves r
  where s.sid=r.sid and r.bid=b.bid and s.sname=upper('lubber');
COLOR
-------------------------
RED
GREEN
RED
```

6) Find the names of sailors who have reserved at least one boat.

```
SQL> select distinct s.sname from sailors s, reserves r where s.sid=r.sid;

SNAME
--------------------------------------------------
DUSTIN
HORATIO
LUBBER
```

7) Compute increments for the ratings of persons who have sailed two different boats on the same day.

```
SQL>  select s.sname,s.rating+1 as rating from sailors s, reserves r1, reserves r2
```

```
  2   where s.sid=r1.sid and s.sid=r2.sid and r1.day=r2.day and r1.bid<>r2.bid;

SNAME                                              RATING
-------------------------------------------------- ----------
DUSTIN                                                  8
DUSTIN                                                  8
```

8) Find the ages of sailors whose name begins and ends with B and has not at least three characters

```
SQL> select s.age from sailors s where s.sname like 'B_%B';

       AGE
----------
      63.5
```

4.Queries using Group By, Order By, and Having Clause

Find the age of the youngest sailor who is eligible to vote (age>18) for each rating level with at least two such sailors;

```
SQL> select s.rating,min(s.age) as minage from sailors s
where s.age>18 group by s.rating
having count(*)>1

    RATING     MINAGE
---------- ----------
         3       25.5
         7         35
         8       25.5
```

For each boat, find the number of reservations for this boat

```
SQL> select b.bid,count(*) as reservationcount from boats b, reserves r
  2  where r.bid=b.bid and b.color='RED'
  3  group by b.bid;

       BID RESERVATIONCOUNT
---------- ----------------
       102                3
       104                2
```

Find the average age of sailors for each rating level that has at least two sailors

```
SQL> select s.rating,avg(s.age) as average from sailors s
  2  group by s.rating
  3  having count(*)>1;

    RATING    AVERAGE
---------- ----------
         3       44.5
         7         40
         8       40.5
        10       25.5
```

5.Queries on Controlling Data: Commit, Rollback, and Save point

Commit command is used to mark the changes as permanent.
Commit command's syntax
commit;

Save Point command is used to temporarily save a transaction so that you can rollback to that point whenever required.

savepoint command's syntax

Savepoint savepoint_name;

```
SQL> CREATE TABLE emp_data (
   no NUMBER(3),
   name VARCHAR(50),
   code VARCHAR(12)
   );

Table created.

SQL> SAVEPOINT table_create;

Savepoint created.

SQL> insert into emp_data VALUES(1,'Opal', 'e1401');

1 row created.

SQL> SAVEPOINT insert_1;

Savepoint created.
```

```
SQL> insert into emp_data VALUES(2,'Becca', 'e1402');


1 row created.


SQL> SAVEPOINT insert_2;


Savepoint created.


SQL> SELECT * FROM emp_data;


        NO NAME                                     CODE
---------- ---------------------------------------- ------------
         1 Opal                                     e1401
         2 Becca                                    e1402
```

ROLLBACK command execute at the end of current transaction and undo/undone any changes made since the begin transaction.

```
ROLLBACK [To SAVEPOINT_NAME];
```

```
SQL> ROLLBACK TO insert_1;


Rollback complete.


SQL> SELECT * FROM emp_data;


        NO NAME                                     CODE
---------- ---------------------------------------- ------------
         1 Opal                                     e1401
```

6. Queries to Build Report in SQL *PLUS

The objective of the lab is to create a form using a parent table and a child table to take advantage of the schema's relationships.

A data block in Oracle Forms = A table in the database.
Each block contains items which equal table columns or fields.
These are arranged into records.

1. Start Schema Builder. Open S_Customer and S_Order or S_Order1.
2. Start Form Builder. Use the data block wizard to create a form for S_Customer, including the Name, ID, Phone, and Address columns.
3. After the form is created, click on Window on the Object Navigator to expand it. Right click on Window1. Click on Property Pallet. Go to Physical on property pallet. Make sure Show Horizontal Scroll Bar and Show Vertical Scroll Bar both are YES.
4. Run the form. Execute the Questionry. Notice that data already exists in this table.
5. Highlight Data Blocks in the Object Navigator. Go up to Tools – Data Block Wizard.
6. Create a form for S_Order or S_Order1.
7. Include the columns ID – Customer_ID – Date_Ordered – Date_Shipped – Total.
8. Click Create Relationship. Click OK. Make sure Autojoin Datablocks is checked.
9. Check Detail Item to Customer_ID and Master Item to ID. This says that the parent table, the table on the one side of the relationship has the primary key of ID in the S_Customer table, and the foreign key on the many side is Customer_ID in the S_Order table. This relationship can be seen if you open schema builder and look at the tables and the relationship between them.
10. Make the layout tabular.
11. Records displayed will be 5 and Display Scrollbar will be checked off.
12. Run the form and execute the Questionry. Scroll through the data and notice that the orders are linked with the customers.

13.If you input a detail, the foreign key is automatically filled with the value of the current primary key displayed by the customer.

7. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints

CREATE A SCHEMA FOR SAILORS RELATION

```
SQL> CREATE TABLE SAILORS (
         SID NUMBER,
         SNAME VARCHAR2 (25),
         RATING NUMBER,
         AGE REAL,
         CONSTRAINT SID_CON PRIMARY KEY (SID)
         );
```

CREATE AN INSTANCE FOR SAILORS RELATION

```
SQL> SELECT * FROM SAILORS;

       SID SNAME                                              RATING                  AGE
---------- -------------------------------------------------- ---------- ----------
        22 DUSTIN                                     7                 45
        29 BRUTUS                                     1                 33
        31 LUBBER                                     8                 55.5
        32 ANDY                                       8                 25.5
        58 RUSTY                                     10                 35
        64 HORATIO                                    7                 35
        71 ZORBA                                     10                 16
        74 HORATIO                                    9                 35
        85 ART                                        3                        25.5
        95 BOB                                        3                        63.5

10 rows selected.
```

CREATE A SCHEMA FOR BOATS RELATION

```
SQL> CREATE TABLE BOATS (
         BID NUMBER,
         BNAME VARCHAR2 (25),
         COLOR VARCHAR2 (25),
         CONSTRAINT BID_CON PRIMARY KEY (BID)
         );
```

CREATE AN INSTANCE FOR BOATS RELATION

```
SQL> SELECT * FROM BOATS;
      BID BNAME               COLOR
---------- ------------------- -------------------------
      101 INTERLAKE           BLUE
      102 INTERLAKE           RED
      103 CLIPPER            GREEN
      104 MARINE             RED
```

CREATE A SCHEMA FOR RESERVERS RELATION

```
SQL> CREATE TABLE RESERVES (
          SID NUMBER,
          BID NUMBER,
          DAY DATE,
          CONSTRAINT SID_CON PRIMARY KEY (SID),
          FOREIGN KEY (SID) REFERENCES SAILORS (SID).
          FOREIGN KEY (BID) REFERENCES BOATS(BID)
);
```

CREATE AN INSTANCE FOR RESERVES RELATION

```
SQL> SELECT * FROM RESERVES;
      SID       BID                 DAY
---------- ---------- ---------
       22        101                10-OCT-98
       22        102                 10-OCT-98
       22        103                 10-AUG-98
       22        104                10-JUL-98
       31        102                 11-NOV-98
       31        103                 11-JUN-98
       31        104                11-DEC-98
       64        101                09-MAY-98
       64        102                09-AUG-98
       74        103                09-AUG-98
```

DROPPING TABLE SYNTAX:

```
DROP TABLE SAILORS

TABLE DROPPED
```

ALTER TABLE statement is a powerful statement to add, manage or update table structure.

ALTER TABLE Statement to you can do following thing,

- SQL TABLE RENAME
- ADD NEW COLUMN IN TABLE
- MODIFY EXISTING COLUMN IN TABLE

- RENAME COLUMN IN TABLE
- DROP THE EXISTING COLUMN IN TABLE

SYNTAX:

```
ALTER TABLE table_name
  RENAME TO new_table_name;
```

```
SQL> ALTER TABLE userinfo RENAME TO user_info;


Table altered.
SQL> ALTER TABLE user_info
  ADD (city VARCHAR2(30),
       country VARCHAR2(30)
  );


Table altered.
```

Creation of Views:-

Syntax:-

```
CREATE VIEW viewname AS
SELECT columnname,columnname
FROM tablename
WHERE columnname=expression_list;
```

Renaming the columns of a view:-

Syntax:-

CREATEVIEWviewnameASSELECTnewcolumnname….FROMta

b a
l m
e e
n WHERE columnname=expression_list;

Selecting a data set from a view-

Syntax:-

S
E
L
E
C
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c
o
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u
m
n
n
a
m
e
,
c
o
l
u
m
n
n
a
m
e
F
R
O
M
v
i
e
w
n
a
m
e
WHERE search condition;

Destroying a view-

Syntax:-

DROP VIEW viewname;

Type of SQL Constraints

- PRIMARY KEY: value in specified column must be unique for each row in a table and not a NULL. Primary key used to identify individual records.
- FOREIGN KEY: value in specified column must have reference in another table (That existing record have primary key or any other constraint).
- NOT NULL: Column value must not be a NULL.
- UNIQUE: Check column value must be unique across the given field in table.
- CHECK: Specific condition is specified, which must evaluate to true for constraint to be satisfied.
- DEFAULT: Default value assign if none of the value specified of given field.
- Syntax:

```
 ALTER TABLE table_name
DROP constraint_name column_name;
SQL> CREATE TABLE emp_info(
    no NUMBER(3,0),
    name VARCHAR(30),
    address VARCHAR(70),
    contact_no VARCHAR(12),
    PRIMARY KEY(no)
);

Table created.
```

```
SQL> CREATE TABLE emp_info(
   no NUMBER(3,0) PRIMARY KEY,
   name VARCHAR(30),
   address VARCHAR(70),
   contact_no NUMBER(12,0)
);

Table created.
```

```
SQL> CREATE TABLE emp_salary(
   no NUMBER(3,0) PRIMARY KEY,
   users_no NUMBER(3,0),
   salary NUMBER(12),
   CONSTRAINT fk_userno FOREIGN KEY (users_no) REFERENCES emp_info(no)
);

Table created.
```

8. Queries on Joins and Correlated Sub-Queries

Joint Multiple Table (Equi Join): Some times we require to treat more than one table as though manipulate data from all the tables as though the tables were not separate object but one single entity. To achieve this we have to join tables.Tables are joined on column that have dame data type and data with in tables.

The tables that have to be joined are specified in the FROM clause and the joining attributes in the WHERE clause.

Algorithm for JOIN in SQL:

1. Cartesian product of tables (specified in the FROM clause)
2. Selection of rows that match (predicate in the WHERE clause)
3. Project column specified in the SELECT clause.

1. Cartesian product:-

Consider two table student and course

```
Select B.*,P.*
FROM student B, course P;
```

2. INNER JOIN:

Cartesian product followed by selection

```
Select B.*,P.*
FROM student B, Course P
WHERE B.course # P.course # ;
```

3. LEFT OUTER JOIN:

LEFT OUTER JOIN = Cartesian product + selection but include rows from the left table which are unmatched pat nulls in the values of attributes belonging to th e second table

Exam:

```
Select B.*,P*
FROM student B left join course p
ON B.course # P.course #;
```

4. RIGHT OUTER JOIN:

RIGHT OUTER JOIN = Cartesian product + selection but include rows from right table which are unmatched

Exam:

```
Select B.*,P.*
From student B RIGHT JOIN course P
B.course# = P course # ;
```

5. FULL OUTER JOIN

Exam

```
Select B.*,P.*
From student B FULL JOIN course P On B.course # = P course #
```

PL/SQL

10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment Operation
s

PL/SQL variables must be declared in the declaration section or in a package as a global variable. When you declare a variable, PL/SQL allocates memory for the variable's value and the storage location is identified by the variable name.

The syntax for declaring a variable is −

```
variable_name [CONSTANT] datatype [NOT NULL] [:= | DEFAULT initial_value]
```

Where, *variable_name* is a valid identifier in PL/SQL, *datatype* must be a valid PL/SQL data type or any user defined data type which we already have discussed in the last chapter. Some valid variable declarations along with their definition are shown below −

```
sales number(10, 2);
pi CONSTANT double precision := 3.1415;
name varchar2(25);
address varchar2(100);
```

Whenever you declare a variable, PL/SQL assigns it a default value of NULL. If you want to initialize a variable with a value other than the NULL value, you can do so during the declaration, using either of the following −

- The **DEFAULT** keyword
- The **assignment** operator

For example −

```
counter binary_integer := 0;
greetings varchar2(20) DEFAULT 'Have a Good Day';
```

You can also specify that a variable should not have a **NULL** value using the **NOT NULL** constraint. If you use the NOT NULL constraint, you must explicitly assign an initial value for that variable.

It is a good programming practice to initialize variables properly otherwise, sometimes programs would produce unexpected results. Try the following example which makes use of various types of variables −

```
DECLARE

  a integer := 10;
```

```
   b integer := 20;
   c integer;
   f real;
BEGIN
   c := a + b;
   dbms_output.put_line('Value of c: ' || c);
   f := 70.0/3.0;
   dbms_output.put_line('Value of f: ' || f);
END;
/
```

When the above code is executed, it produces the following result −

```
Value of c: 30
Value of f: 23.333333333333333333

PL/SQL procedure successfully completed.
```

An initialization using the assignment operator (:=)

```
SQL>
SQL> -- An initialization using the assignment operator (:=).
SQL> set serverout on;
SQL>
SQL> DECLARE
  2     X NUMBER(11,2) := 10;
  3
  4  BEGIN
  5     DBMS_OUTPUT.PUT_LINE(x);
  6  END;
  7
  8  /
10
```

```
PL/SQL procedure successfully completed.


SQL>
```

11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL

```
create or replace function myfn return varchar2 is
  v_dname varchar2(20);
begin
  select dname
  into   v_dname
  from   dept
  where  deptno = &p_deptno;
  return v_dname;
end;
```

```
Enter value for p_deptno: 20
old   7:   where  deptno = &p_deptno;
new   7:   where  deptno = 20;
```

12. Write a PL/SQL block using SQL and Control Structures in PL/SQL

Using IF statement:

```
 DECLARE

sales NUMBER(8,2) := 10100;

quota NUMBER(8,2) := 10000;

bonus NUMBER(6,2);

emp-id NUMBER(6) := 120;

BEGIN

IF sales > (quota + 200) THEN

bonus := (sales - quota)/4;

UPDATE employees SET salary = salary + bonus WHERE employee-id = emp-id;

END IF;

END;
```

Using CASE Statement:

```
DECLARE

grade CHAR(1);

BEGIN

grade := 'B';

CASE grade

WHEN 'A' THEN DBMS-OUTPUT.PUT-LINE('Excellent');

WHEN 'B' THEN DBMS-OUTPUT.PUT-LINE('Very Good');

WHEN 'C' THEN DBMS-OUTPUT.PUT-LINE('Good');

WHEN 'D' THEN DBMS-OUTPUT.PUT-LINE('Fair');

WHEN 'F' THEN DBMS-OUTPUT.PUT-LINE('Poor');

ELSE DBMS-OUTPUT.PUT-LINE('No such grade');

END CASE;

END;
```

Using Case Statement:

```
DECLARE

p NUMBER := 0;

BEGIN

FOR k IN 1..500 LOOP -- calculate pi with 500 terms

p := p + ( ( (-1) ** (k + 1) ) / ((2 * k) - 1) );
```

```
END LOOP;

p := 4 * p;

DBMS-OUTPUT.PUT-LINE( 'pi is approximately : ' || p ); -- print result

END;
```

13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types

1.Write a PL/SQL cursor to display employee name

```
SQL> declare
cursor empcursor
is
select *
from emp;
v_empdata empcursor%rowtype;
begin
open empcursor;
loop
  fetch empcursor into v_empdata;
  exit when empcursor%notfound;
  dbms_output.put_line(v_empdata.ename);
end loop;
close empcursor;
end;
/
```

OUTPUT:-

```
SMITH
ALLEN
WARD
JONES
MARTIN
BLAKE
CLARK
SCOTT
KING
TURNER
ADAMS
JAMES
FORD
MILLER
SUDHEER

PL/SQL procedure successfully completed.
```

2.Write a PL/SQL cursor to display employee name and display number of records processed

```
SQL> declare
cursor empcursor is
select * from emp;
v_empdata empcursor%rowtype;
begin
open empcursor;
loop
  fetch empcursor into v_empdata;
  exit when empcursor%notfound;
  dbms_output.put_line('Record Number: '||empcursor%rowcount||' '||v_empdata.ename);
  end loop;
close empcursor;
end;
/
OUTPUT:-

RecordNumber: 1 SMITH
RecordNumber: 2 ALLEN
RecordNumber: 3 WARD
RecordNumber: 4 JONES
RecordNumber: 5 MARTIN
RecordNumber: 6 BLAKE
RecordNumber: 7 CLARK
RecordNumber: 8 SCOTT
RecordNumber: 9 KING
RecordNumber: 10 TURNER
RecordNumber: 11 ADAMS
RecordNumber: 12 JAMES
RecordNumber: 13 FORD
RecordNumber: 14 MILLER
RecordNumber: 15 SUDHEER

PL/SQL procedure successfully completed.
```

3.Write a program to fetch all the data from a table and display it on the screen using %row type attribute.

```
                                        declare
                                        cursor c is select * from dept;
                                           rec c%ROWTYPE;
                                        BEGIN
                                        2open c;
                                        loop
                                            fetch c into rec;
                                        exit when c%notfound;
Dbms_output.put_line('deptno:'||rec.deptno);
Dbms_output.put_line('dname:'||rec.dname);
                                          End loop;
                                          close c;
                                          end;
```

```
Output:
Set serveroutput on
deptno:10
dname: ACCOUNTING
deptno:20
dname:RESEARCH
deptno:30
dname:SALES

PL/SQL procedure successfully completed.
```

4. Write a program to display the number of records of any given table %rowcount.

```
                                         declare
                                         cursor c is select * from dept;
                                             rec c%ROWTYPE;
                                         BEGIN
                                         open c;
                                         loop
                                              fetch c into rec;
                                         exit when c%rowcount=4;
Dbms_output.put_line('deptno='||rec.deptno);
Dbms_output.put_line('dname='||rec.dname);
Dbms_output.put_line('loc='||rec.loc);
                                         end loop;
                                         close c;
                                         end;
```

```
Output:
set serveroutput on

>deptno10
dname=ACCOUNTING
loc=NEW YORK
deptno=20
dname=RESEARCH
loc=DALLAS
deptno=30
dname=SALES
```

```
                              loc=CHICAGO
                              PL/SQL procedure successfully completed.
```
5.Write a program to check whether the cursor is opened or not. if cursor is opened “Display Cursor Already Opened” else open the cursor and display the message “Opened the cursor”.

```
                              declare

                               cursor c1 is select * from emp;
                              begin
          open c1;

                                   if c1%isopen then
                                   dbms_output.put_line(‘cursor is already open’);
                                   else
                                   open c1;
                                   dbms_output.put_line(‘opened cursor’);
                                   end if;
                                   close c1;
                                end;

                              Output:
                              set serveroutput
                              SQL> @pp2
                               15   /
                               cursor is already open’
```

6.Write a program to fetch all the data from salgrade table using cursor FOR loop.
```
                               declare
                              cursor c1  is select * from salgrade ;
                              begin
                              for rec in c1 loop
                              dbms_output.put_line('grade='||rec.grade);
                              dbms_output.put_line('hisal=’||rec.hisal);
dbms_output.put_line('losal='||rec.losal);
                              end loop;
                              end;

                              Output:
                              set serveroutput
                               grade=12
                               hisal=10
```

Aim: Write PL/SQL procedure for an application using exception handling.

<u>PREDEFINED EXCEPTIONS:</u>

NO_DATA_FOUND

```
SQL>
  1  declare
  2  v_empno emp.empno%type:=&eno;
  3  v_ename emp.ename%type;
  4  v_sal emp.sal%type;
  5  begin
  6  select ename,sal into v_ename,v_sal from emp where empno=v_empno;
  7   dbms_output.put_line('Name: ' ||v_ename  || 'Salary: '||v_sal);
  8  exception
  9  when NO_DATA_FOUND then
 10   dbms_output.put_line('Sorry, Data is not found.');
 11* end;
SQL> /
Enter value for eno: 7788
old   2: v_empno emp.empno%type:=&eno;
new   2: v_empno emp.empno%type:=7788;
Name: SCOTTSalary: 3000

PL/SQL procedure successfully completed.

SQL> /
Enter value for eno: 5
old   2: v_empno emp.empno%type:=&eno;
new   2: v_empno emp.empno%type:=5;
Sorry, Data is not found.

PL/SQL procedure successfully completed.
```

TOO_MANY_ROWS

```
SQL> declare
  2  v_emp emp%rowtype;
  3  v_sal emp.sal%type:=&sal;
  4  begin
  5  select * into v_emp from emp where sal=v_sal;
  6   dbms_output.put_line('Name: ' ||v_emp.ename  || 'Salary: '||v_emp.sal);
  7  exception
  8  when TOO_MANY_ROWS then
  9   dbms_output.put_line('More Than one employee having same salary');
 10  end;
 11  /
Enter value for sal: 800
old   3: v_sal emp.sal%type:=&sal;
new   3: v_sal emp.sal%type:=800;
```

```
ERROR at line 1:
ORA-01403: no data found
ORA-06512: at line 5


SQL> /
Enter value for sal: 5000
old   3: v_sal emp.sal%type:=&sal;
new   3: v_sal emp.sal%type:=5000;
More Than one employee having same salary

PL/SQL procedure successfully completed.

SQL> /
Enter value for sal: 1500
old   3: v_sal emp.sal%type:=&sal;
new   3: v_sal emp.sal%type:=1500;
Name: TURNERSalary: 1500

PL/SQL procedure successfully completed.
```

INVALID_NUMBER

```
SQL> ed
Wrote file afiedt.buf

  1  declare
  2  v_empno varchar2(4):='&empno';
  3  v_ename varchar2(20):='&ename';
  4  v_deptno varchar2(2):='&deptno';
  5  begin
  6  insert into emp(empno,ename,deptno) values(v_empno,v_ename,v_deptno);
  7  exception
  8  when INVALID_NUMBER then
  9   dbms_output.put_line('Given employee number or department number is invalid');
 10* end;
SQL> /
Enter value for empno: 10
old   2: v_empno varchar2(4):='&empno';
new   2: v_empno varchar2(4):='10';
Enter value for ename: xyz
old   3: v_ename varchar2(20):='&ename';
new   3: v_ename varchar2(20):='xyz';
Enter value for deptno: 10
old   4: v_deptno varchar2(2):='&deptno';
new   4: v_deptno varchar2(2):='10';
```

```
PL/SQL procedure successfully completed.

SQL> /
Enter value for empno: 11
old   2: v_empno varchar2(4):='&empno';
new   2: v_empno varchar2(4):='11';
Enter value for ename: abc
old   3: v_ename varchar2(20):='&ename';
new   3: v_ename varchar2(20):='abc';
Enter value for deptno: a
old   4: v_deptno varchar2(2):='&deptno';
new   4: v_deptno varchar2(2):='a';
Given employee number or department number is invalid

PL/SQL procedure successfully completed.
```

VALUE_ERROR

```
SQL>
  1  declare
  2  v_num1 number;
  3  begin
  4  v_num1:='&givenumber1'+'givenumber2';
  5  dbms_output.put_line('The result of the operation is: ' || v_num1);
  6  exception
  7  when VALUE_ERROR then
  8  dbms_output.put_line('Please check- there is source of invalid values in input ');
  9* end;
SQL> /
Enter value for givenumber1: 10
old   4: v_num1:='&givenumber1'+'givenumber2';
new   4: v_num1:='10'+'givenumber2';
Please check- there is source of invalid values in input

PL/SQL procedure successfully completed.
```

CASE_NOT_FOUND

```
SQL>
  1  declare
  2   v_op varchar(2):='&op';
  3  v_num1 number:=&op1;
  4   v_num2 number:=&op2;
  5   begin
  6   case
  7  when v_op= '+' then
  8   dbms_output.put_line('The sum is:' ||to_number(v_num1+v_num2));
  9   when v_op= '-' then
 10   dbms_output.put_line('The difference is:' ||to_number(v_num1-v_num2));
 11   when v_op= '*' then
 12    dbms_output.put_line('The Multiplication is:' ||to_number(v_num1*v_num2));
 13    when v_op= '/' then
 14    dbms_output.put_line('The Quotient is:' ||to_number(v_num1/v_num2));
 15   when v_op= '**' then
 16   dbms_output.put_line('The power is:' ||to_number(v_num1**v_num2));
 17    end case;
 18  exception
 19  when CASE_NOT_FOUND then
 20   dbms_output.put_line('raised the exception case_not_found');
 21*  end;
SQL> /
Enter value for op: ++
old   2:  v_op varchar(2):='&op';
new   2:  v_op varchar(2):='++';
Enter value for op1: 10
old   3: v_num1 number:=&op1;
new   3: v_num1 number:=10;
Enter value for op2: 10
old   4:  v_num2 number:=&op2;
new   4:  v_num2 number:=10;
raised the exception case_not_found

PL/SQL procedure successfully completed.
```

MORE THAN ONE

```
SQL> declare
  2    l_empno emp.empno%type;
  3    l_job emp.job%type;
  4    incment number;
  5  begin
  6    l_empno:=&empno;
  7    select job into l_job from emp where empno=l_empno;
  8    if l_job='CLERK' then
  9           incment:=100;
 10     elsif l_job='SALESMAN' then
 11           incment:=200;
 12     else
 13           incment:=300;
 14     end if;
 15    update emp set sal=sal+incment where empno=l_empno;
 16    Exception
 17          when no_data_found then
 18                dbms_output.put_line('No Employee in Organization');
 19          when too_many_rows then
 20                dbms_output.put_line('Only allowed for one row');
 21  end;
 22  /
Enter value for empno: 7788
old   6:    l_empno:=&empno;
new   6:    l_empno:=7788;

PL/SQL procedure successfully completed.

SQL> /
Enter value for empno: 2
old   6:    l_empno:=&empno;
new   6:    l_empno:=2;
No Employee in Organization

PL/SQL procedure successfully completed.
```

ZERO_DIVIDE

```
SQL>
  1  declare
  2  v_num1 number:=&num1;
  3  v_num2 number:=&num2;
  4  v_result number;
  5  begin
  6  v_result:=v_num1/v_num2;
  7  dbms_output.put_line('The Result is: ' || v_result);
  8  exception
  9  when ZERO_DIVIDE then
 10  dbms_output.put_line('Fatal Error-- dividion by zero occoured');
 11* end;
SQL> /
Enter value for num1: 20
old   2: v_num1 number:=&num1;
new   2: v_num1 number:=20;
Enter value for num2: 2
old   3: v_num2 number:=&num2;
new   3: v_num2 number:=2;
The Result is: 10

PL/SQL procedure successfully completed.
```

```
SQL> /
Enter value for num1: 20
old   2: v_num1 number:=&num1;
new   2: v_num1 number:=20;
Enter value for num2: 0
old   3: v_num2 number:=&num2;
new   3: v_num2 number:=0;
Fatal Error-- dividion by zero occoured

PL/SQL procedure successfully completed.
```

USER DEFINED EXCEPTIONS

```
SQL> declare
  2  nullsal exception;
  3  mysal emp.sal%type;
  4  begin
  5   select sal into mysal from emp where empno=&n;
  6   if mysal is null or mysal=0 then
  7   raise nullsal;
  8   else
  9    dbms_output.put_line(mysal);
 10    end if;
 11    exception
 12    when nullsal then
 13    dbms_output.put_line('salary is null');
 14  end;
 15  /
Enter value for n: 7788
old   5:  select sal into mysal from emp where empno=&n;
new   5:  select sal into mysal from emp where empno=7788;
salary is null

PL/SQL procedure successfully completed.
```

14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS

1. Aim: Write a DBMS program to prepare reports for an application using functions.

Write a PL/SQL procedure to update the employee salary

```
SQL> create or replace procedure mybonus as
  cursor deptcursor is select deptno from dept;
    begin
    for r in deptcursor
    loop
    update dept set sal=sal*0.95 where deptno=r.deptno;
    dbms_output.put_line('the bonus information is; ' ||r.deptno);
    end loop;
    end mybonus;
   /

Procedure created.

SQL> save p1
Created file p1
SQL> begin
   mybonus;
   end;
   /
the bonus information is; 10
the bonus information is; 20
the bonus information is; 30
the bonus information is; 40

PL/SQL procedure successfully completed.
```

2. Write a PL/SQL procedure to display the employee details

```
SQL> create or replace procedure getnamesaljob(pempno emp.empno%type) as
    v_ename emp.ename%type;
    v_sal emp.sal%type;
    v_job emp.job%type;
    begin
    select ename,sal,job into v_ename,v_sal,v_job from emp where empno=pempno;
    dbms_output.put_line('The details of employee: '||pempno);
    dbms_output.put_line('The Name of the employee is:'||v_ename);
    dbms_output.put_line('The salary of the employee is;'||v_sal);
   dbms_output.put_line('The job of the employee is:'||v_job);
   end getnamesaljob;
   /

Procedure created.
```

```
SQL> save p2
Created file p2
SQL> exec getnamesaljob(7788);
The details of employee: 7788
The Name of the employee is:SCOTT
The salary of the employee is;3000
The job of the employee is:ANALYST

PL/SQL procedure successfully completed.
```

3. Write a PL/SQL procedure to find the given number is even or odd

```
SQL> ed
Wrote file afiedt.buf

  create or replace procedure oddnumber(num1 number,num2 number) as
   mynum number(4);
   begin
   mynum:=num1;
   while mynum<num2
   loop
   if mod(mynum,2)!=0 then
   dbms_output.put_line('The odd number ' ||mynum);
   end if;
  mynum:=mynum+1;
  end loop;
 end;
SQL> /

Procedure created.

SQL> exec oddnumber(10,20);
The odd number 11
The odd number 13
The odd number 15
The odd number 17
The odd number 19

PL/SQL procedure successfully completed.
```

Functions

```
SQL> ed
Wrote file afiedt.buf
```

```
   create or replace function factorial(num number) return number
   is
   fact number(4):=1;
   begin
   for myindex in reverse 1..num
   loop
   fact:=fact*myindex;
   end loop;
   return fact;
 end;

SQL> ed
Wrote file afiedt.buf

   declare
   v_factorial number(4):=0;
   begin
   v_factorial:=factorial(5);
   DBMS_OUTPUT.PUT_LINE('The factorial value is :   ' || v_factorial);
  end;
SQL> /
The factorial value is :   120

PL/SQL procedure successfully completed.




SQL> ed
Wrote file afiedt.buf

    create or replace function combination(num1 number,num2 number) return number
    as
    combi number(7):=1;
    begin
   combi:=factorial(num1)+factorial(num2);
   return combi;
  end;
SQL> /

Function created.

SQL> save combination
Created file combination
SQL> declare
```

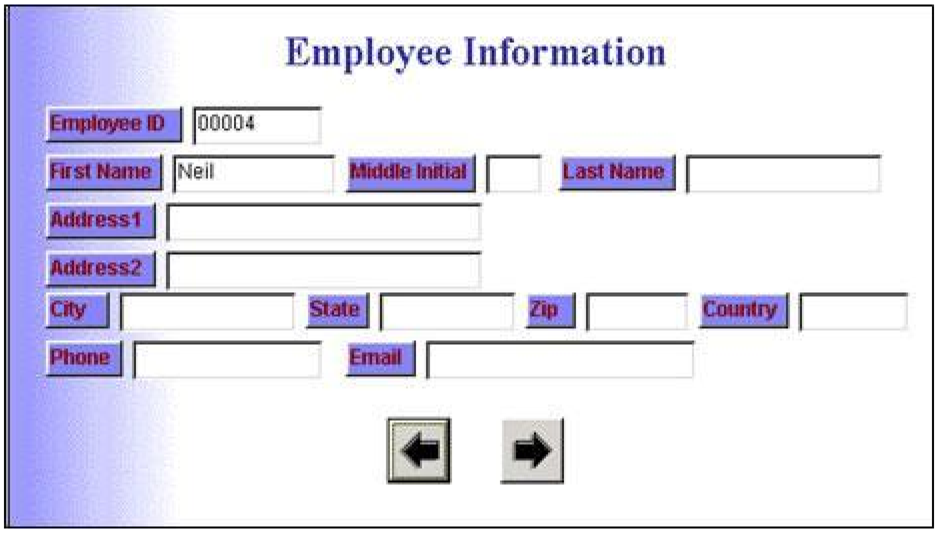
```
   totals number(5):=0;
   begin
   totals:=combination(5,5);
   DBMS_OUTPUT.PUT_LINE('The sum of factorial is :  ' || totals);
   end;
   /
The sum of factorial is :  240

PL/SQL procedure successfully completed.
```

```
SQL> create or replace function empexp(v_empno number) return number as
   v_hiredate emp.hiredate%type;
  v_exp number(6,2):=1;
  begin
   select hiredate into v_hiredate from emp where empno=v_empno;
   v_exp:=months_between(sysdate,v_hiredate)/12;
   return v_exp;
   end;
   /

Function created.

SQL> ed
Wrote file afiedt.buf

   declare
   exp number;
   begin
   exp:=empexp(7788);
   DBMS_OUTPUT.PUT_LINE('Given employee experience is: ' || exp || ' Years');
  end;
SQL> /
Given employee experience is: 23.42 Years

PL/SQL procedure successfully completed.
```

15. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc.

To be done while developing Mini project.

Example of a Employee Information System,which is been developed by Web Technologies.



16. Demonstration of database connectivity

Connect to MySQL

To experiment with JDBC (Java database connectivity) you have to create a database and connect to it. On successful connection you get MySQL command prompt mysql>as follows:

```
C:\> mysql -h localhost -u root
Enter password: *****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 7
Server version: 5.1.46-community MySQL Community Server (GPL)

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and you are welcome to modify and redistribute it under the GPL v2 license

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

2. Create Database

To create a database you have to supply CREATE DATABASE command followed by the database name and then semicolon.

```
mysql> CREATE DATABASE EXPDB;
Query OK, 1 row affected (0.08 sec)

mysql>
```

3. Use Database

Once you have created the database then you have to select it for use to perform operations on it. Command USE <DATABASE-NAME> begins a mysql (The MySQL Command-line Tool) session and lets you perform database operations. Note that, you need to create database only once but have to use it each time you start a mysql session.

```
mysql> USE EXPDB;
Database changed

mysql>
```

4. Create a table

The EXPTABLE, example table to demonstrate JDBC (Java database connectivity) is created by issuing CREATE TABLE command as shown below:

```
mysql> CREATE TABLE EXPTABLE (
   -> ID INT NOT NULL AUTO_INCREMENT PRIMARY KEY,
   -> NAME VARCHAR (50)
   -> );
Query OK, 0 rows affected (0.20 sec)

mysql>
```

5. Insert Records

Just for illustration, two records into EXPTABLE are being inserted, you can insert more if you like. Later we will perform select and edit operations on these records using JDBC (Java database connectivity).

```
mysql> INSERT INTO EXPTABLE (NAME) VALUES ("ANUSHKA K");
Query OK, 1 row affected (0.09 sec)

mysql> INSERT INTO EXPTABLE (NAME) VALUES ("GARVITA K");
Query OK, 1 row affected (0.00 sec)

mysql>
```