WEEK – 1

Implement the following using DUAL table:

a) Character functions

b) Numeric functions

c) Date functions

d) Conversion functions.

The DUAL table is a special, single-row, single-column table used in Oracle (and similar) databases primarily to satisfy the SQL syntax requirement of a FROM clause when executing functions or calculations that don't need data from a user table.

Implementation Using DUAL Table

a) **Character Functions**

- **Purpose:** Manipulate or return information about character strings.
- **DUAL Use:** Allows developers to test string operations directly.

b) **Numeric Functions**

- **Purpose:** Performmathematical calculations.
- **DUAL Use:** EnablesSQL to be used as a calculator for one-off operations.

c) **Date Functions**

- **Purpose:** Operateon and retrieve date and time information.
- **DUAL Use:** Standard method to get the current system date/time or perform date arithmetic.

d) **Conversion Functions**

- **Purpose:** Changedatafrom one datatype (e.g., Date, Number) to another (e.g., Character).
- **DUAL Use:** Testingformatting and conversion logic before applying it to table data.

```
SQL*Plus: Release 11.2.0.1.0 Production on Mon Jul 21 13:57:34 2025
Copyright (c) 1982, 2010, Oracle. All rights reserved. Enter user-name:
24071A6612@Orcl11g/24071A6612

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.1.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
```

Character functions

```
1. select ascii('a') from dual;
   ASCII('A')
   -------
     97

2. select chr('100') from dual;
   C
   -
   D

3. select concat('hello','world') from dual;
   CONCAT('HE
   ----------
   Helloworld

4. select initcap('database management systems') from dual;
   INITCAP('DATABASEMANAGEMENT
   ---------------------------
   Database Management Systems

5. select instr('character','h') from
   dual; INSTR('CHARACTER','H')
   ---------------
                  2

6. select length('dual table') from dual;
   LENGTH('DUALTABLE')
   -------------
              10

7. select lower('Schema and INSTANCE') from dual;
   LOWER('SCHEMAANDINS
   -------------
   schema and instance

8. select upper('datatype') from dual;
   UPPER('D
   --------
   DATATYPE


9. select rpad('primary',8,'A') from dual;
   RPAD('PR
   --------
   primaryA


10. select lpad('primary',8,'A') from
   dual; LPAD('PR
   --------
   Aprimary



11. select replace('jack and jond','j','bl') from
   dual; REPLACE('JACKAN
   - - - - - - - - - -
   black and blond

12. select translate('jack and jond','j','bl') from dual;
   TRANSLATE('JA
   -------------
   back and bond


13. select rtrim('vnrvjiet','iet') from dual;
   RTRIM
   -----
   vnrvj


14. select ltrim('vnrvjiet','vnr') from
   dual; LTRI
   ----
   jiet


15. select substr('Oracle','1','3') from
   dual; SUBSTR
   ---
   Ora
```

Numeric functions

1. select mod(14,5) from dual;

```
MOD(14,5)
-------
 4
```

2. select power(2,2) from dual;

```
POWER(2,2)
-------
   4
```

3. select round(5.778,2) from dual;

```
ROUND(5.778,2)
----------
5.78
```

4. select trunc(5.778,2) from dual;

```
TRUNC(5.778,2)
----------
5.77
```

5. select sqrt(25) from dual;

```
SQRT(25)
-------
5
```

6. select floor(4.99) from dual;

```
FLOOR(4.99)
-------
4
```

7. select ceil(4.01) from dual;

```
CEIL(4.01)
-------
   5
```

8. select (14*8) from dual;

```
(14*8)
-------
 112
```

Date functions

1. select add_months(date '2025-09-15',1) from dual;

```
ADD_MONTH
---------
15-OCT-25
```

2. select current_date from dual;

```
CURRENT_D
---------
21-JUL-25
```

3. select sysdate from dual;

```
SYSDATE
---------
21-JUL-25
```

4. select current_timestamp from dual;

```
CURRENT_TIMESTAMP
---------------------------------------------------------------------------
21-JUL-25 15.41.16.427000 +05:30
```

5. select extract(day from date '2025-12-02') from dual;

```
EXTRACT(DAYFROMDATE'2025-12-02')
--------------------------------
2
```

6. select last_day(date '2016-02-01') from dual;

```
LAST_DAY(
---------
29-FEB-16
```

7. select months_between(date '2031-03-12',date '2024-08-28') from dual;

```
MONTHS_BETWEEN(DATE'2024-08-28',DATE'2031-03-12')
-------------------------------------------------
78.483871
```

8. select next_day(date '2012-02-12','thursday') from dual;

```
NEXT_DAY(
---------
16-FEB-12
```

9. select round(date '2023-12-01','YYYY') from dual;

```
ROUND(DAT
---------
01-JAN-24
```

10. select trunc(date '2023-12-01','YYYY') from dual;

```
TRUNC(DAT
---------
01-JAN-23
```

Conversion functions

1. select to_char (date '2017-01-01') from dual;

```
TO_CHAR(D
---------
01-JAN-17
```

2. select to_date('01 jan 2017') from dual;

```
TO_DATE('
---------
01-JAN-17
```

WEEK – 2

Practice DDL and DML commands on a basic table without integrity constraints.

DDL Commands (Data Definition Language)

DDL commands are used to define or modify the structure of database objects. They handle the schema itself.

- **CREATE:** Defines and builds a new table, specifying column names and data types.
- **ALTER:** Changes the existing structure of a table, such as adding, modifying, or dropping a column.
- **TRUNCATE:** Removes all rows from a table structure rapidly, but keeps the empty structure intact. It's classified as DDL because it resets the table's storage allocation.
- **DROP:** Completely removes a table (structure and all data) from the database.

DML Commands (Data Manipulation Language)

DML commands are used to manage and manipulate the datawithin the structured tables.

- **INSERT:** Adds new rows (records) of data into a table.
- **SELECT:** Retrieves data from the database. (Often called DQL - Data Query Language).
- **UPDATE:** Modifies existing data in one or more rows of a table.
- **DELETE:** Removes specific rows from a table based on a condition (or all rows if no condition is specified).

1 .Creation of a table using command ‘CREATE’

```
SQL> create table student(name varchar2(30), rollno number(15), branch varchar2(10),
joining_date date);

Table created.
```

2 . Adding column to a table using command ‘ALTER’

```
SQL> alter table student add email varchar2(15);

Table altered.
```

3 . Modify a column of a table using command ‘ALTER’

```
SQL> alter table student modify email varchar(10);

Table altered.
```

4 . Inserting elements in to table using command ‘INSERT’

```
insert into stud values('banana',673,'aiml','20-AUG-2028','abc@gil.com');

1 row created.

insert into stud values('apple',100,'cse','20-SEP-2022','a@gil.com');

1 row created.

insert into stud values('laptop',345,'ece','12-OCT-2025','a@gil.com');

1 row created.

insert into stud values('mobile',765,'aiml','22-NOV-2029','a@gil.com');

1 row created.
```

5 . Update a column of a table using command ‘UPDATE’

```
UPDATE student SET email = 'xyz@gmail.com' WHERE rollno = 100;
```

6 . Display only few columns of a table using command ‘SELECT’

```
SELECT name, rollno, branch FROM student;

NAME      ROLLNO BRANCH
- - - - - - - --------- - - - - - -
banana    673     aiml
apple     100     cse
laptop    345     ece
mobile    765     aiml
```

7. . Display the entire table

```
SELECT * FROM student;
NAME      ROLLNO BRANCH JOINING_DATE EMAIL
------ --------- ----- --------------- ---------
banana    673      aiml     20-AUG-2028 abc@gil.com
apple     100     cse      20-SEP-2022 a@gil.com
laptop    345     ece      12-OCT-2025 a@gil.com
mobile    765      aiml     22-NOV-2029 a@gil.com
```

8. Delete a row from table by using where condition

```
SQL> DELETE FROM student WHERE name = 'laptop';
1 row deleted.
```

9. Use TRUNCATE command

```
SQL> TRUNCATE TABLE student;
Table truncated.
```

10. Use DROP command to drop table

```
SQL> DROP TABLE student;
Table dropped.
```

WEEK – 3

Practice DDL and DML commands on a Relational Database, specifying the Integrity constraints. (Primary Key, Foreign Key, CHECK, NOT NULL)

Integrity Constraints

Integrity constraints are rules defined at the column or table level to enforce data validity and consistency within a relational database.

- **Primary Key (PK)**
  - Definition:Acolumn or set of columns that uniquely identifies each record in a table. It ensures that no two rows have the same primary key value.
  - Rules Enforced:Uniqueness (no duplicate values) and Not Null (must always have a value).
- **Foreign Key (FK)**
  - Definition:A column or set of columns in one table that refers to the Primary Key of another table (or the same table).
  - Rules Enforced:Referential Integrity, which means data in the referencing column(s) must match an existing value in the referenced Primary Key column(s), thereby linking the two tables.
- **CHECK**
  - Definition:A constraint that defines a condition that every value in a column must satisfy.
  - Rules Enforced:Domain Integrity, ensuring that data values fall within a specific, defined range or meet a logical requirement (e.g., salary must be greater than zero).
- **NOT NULL**
  - Definition:Asimple constraint that ensures a column cannot contain a null value.
  - Rules Enforced: Requires that every record has an explicit value supplied for that column.

```
SQL*Plus: Release 11.2.0.1.0 Production on Mon Aug 4 14:56:23 2025 Copyright
(c) 1982, 2010, Oracle. All rights reserved. Enter user-name:
24071A6612@Orcl11g Enter password: Connected to: Oracle Database 11g
Enterprise Edition Release 11.2.0.1.0 - 64bit Production With the Partitioning,
OLAP, Data Mining and Real Application Testing options
```

1.Use the NOT NULL Constraint

```
SQL> CREATE TABLE data( fname VARCHAR2(20) NOT NULL, lname VARCHAR2(20),
id NUMBER(10));
Table created.
SQL> insert into data values(‘shin’,’chan’,11);
1 row created.

SQL> select* from person;

  fname lname            id
– – – – – – – ------------ ------------
       shin chan          11
SQL> insert into person values(‘motu’,’patlu’,22);
1 row created.
SQL> select* from person;
  fname lname            id
– – – – – – – ------------ ------------
        shin chan          11
      motu patlu           22

SQL> insert into person values(NULL,’doreamon’ ,18); insert into person
values(NULL,’doreamon’ ,18); ERROR at line 1: ORA-01400: cannot
insert NULL into ("24071A6612"."DATA"."fname")
```

2.Use the NOT NULL Constraint on ALTER table

```
SQL> SQL> ALTER TABLE data MODIFY id NUMBER(10) NOT NULL;
Table altered. SQL> insert into person values(‘ninja’,’hattori’,NULL); insert
into person values(‘ninja’,’hattori’,NULL); ERROR at line 1: ORA-01400:
cannot insert NULL into ("24071A6612"."DATA"."id")                    *
```

3.Use UNIQUE Constraint

```
SQL> create table univ(sno number(10),book_name varchar2(20) unique,DOT Date);
Table created.
SQL> insert into univ values(111,'abc','21-may-2021');
1 row created.
SQL> insert into univ values(111,'abc','21-may-2021');
 insert into univ values(111,'abc','21-may-2021');
* ERROR at line 1: ORA-00001: unique constraint
(24071A6612.SYS_C00103522) violated
```

4.Use UNIQUE Constraint on ALTER table

```
SQL> alter table person add unique(ID);
Table altered.
```

5.Use CHECK Constraint

```
SQL> CREATE TABLE orderss(
    id NUMBER(20),
    name VARCHAR2(20),
    CONSTRAINT id_c CHECK(id >= 1)
   );
Table created.
SQL> INSERT INTO orderss VALUES(0, 'dfs');
```

```
* ERROR at line 1: ORA-02290: check constraint
(24071A6612.ID_C) violated SQL> INSERT INTO orderss
VALUES(5, 'abc'); 1 row created. SQL> SELECT * FROM
orderss;


ID     NAME
- -     - - -
5      abc
SQL> ALTER TABLE orderss DROP CONSTRAINT id_c;
Table altered.
```

6. Use DEFAULT Constraint

```
SQL> CREATE TABLE city(name VARCHAR2(15), pincode NUMBER(6) DEFAULT
'101010');
Table created.
SQL> INSERT INTO city(name) VALUES ('ffwrf');
1 row created.
SQL> SELECT * FROM city;
NAME      PINCODE
- - - - - - - -----------
ffwrf     101010
```

7. Use DEFAULT Constraint on ALTER TABLE

```
SQL> CREATE TABLE person(id NUMBER(10), last_name VARCHAR2(20),
fname,VARCHAR2(20), age NUMBER(10));
Table created.
SQL> ALTER TABLE person ADD city VARCHAR2(17);
Table altered.
SQL> ALTER TABLE person MODIFY city DEFAULT 'hyderabad';
Table altered.
SQL> INSERT INTO person(id, last_name, fname, age) VALUES (16, 'iuy', 'kij', 76);
1 row created.
```

```
SQL> SELECT * FROM person;
ID     LAST_NAME FNAME AGE       CITY
--     ------   ---   --    ---
16     iuy        kij    76    hyderabad
```

8.Use PRIMARY KEY Constraint

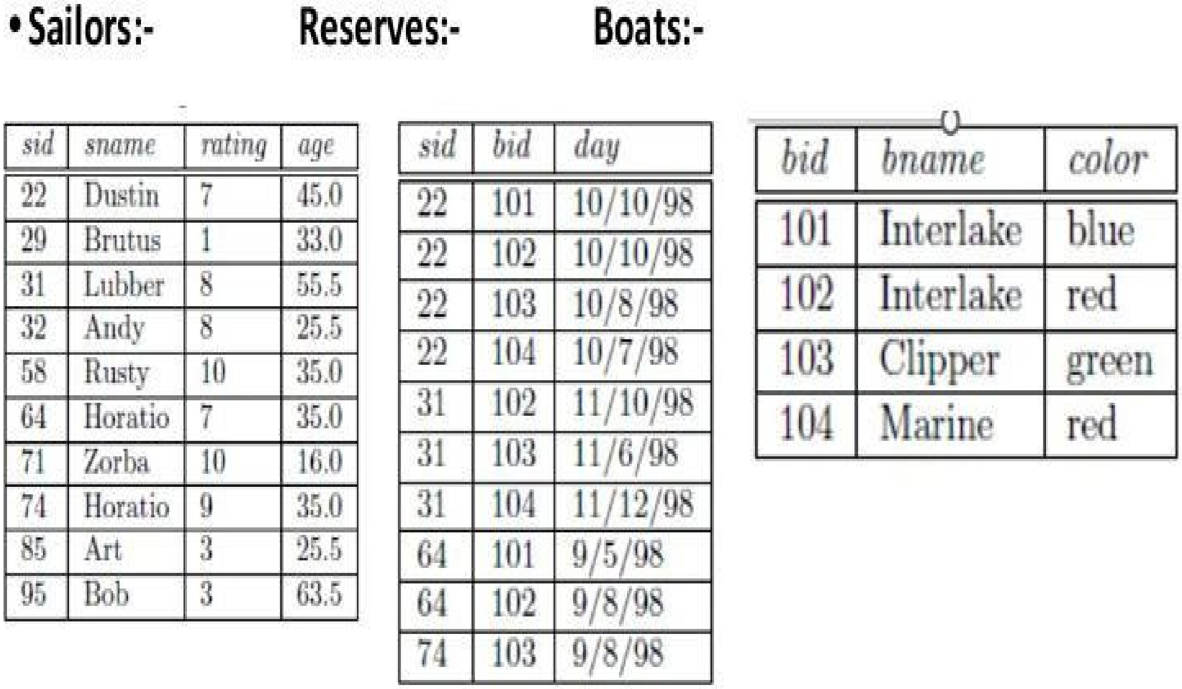
```
SQL> CREATE TABLE univ(sno NUMBER(10), book_name VARCHAR2(20) PRIMARY
KEY, DOT DATE);
Table created.
SQL> INSERT INTO univ VALUES(12, 'FGD', '16-MAY-2020');
1 row created.
SQL> SELECT * FROM univ;
SNO BOOK_NAME DOT
--    ------    -------
12    FGD         16-MAY-20
```

9.Use PRIMARY KEY AS CONSTRAINT

```
SQL> create table persons9 (id int Not null,lastname varchar(20) not null,firstname
varchar(20),age int,constraint pk_person2 primary key(id));
Table created.
SQL> insert into persons9 values(14,’abc’,’def’,15);
1 row created.
SQL> select* from persons9;
      ID LASTNAME           FIRSTNAME                AGE
------ ---------------------- ------------ -------
      14 viskre                        15
```

WEEK – 4

Apply the concepts of Joins, SET operations and SQL functions on any two relational schema.



• Sailors:-

sid	*sname*	*rating*	*age*
22	Dustin	7	45.0
29	Brutus	1	33.0
31	Lubber	8	55.5
32	Andy	8	25.5
58	Rusty	10	35.0
64	Horatio	7	35.0
71	Zorba	10	16.0
74	Horatio	9	35.0
85	Art	3	25.5
95	Bob	3	63.5

Reserves:-

sid	*bid*	*day*
22	101	10/10/98
22	102	10/10/98
22	103	10/8/98
22	104	10/7/98
31	102	11/10/98
31	103	11/6/98
31	104	11/12/98
64	101	9/5/98
64	102	9/8/98
74	103	9/8/98

Boats:-

bid	*bname*	*color*
101	Interlake	blue
102	Interlake	red
103	Clipper	green
104	Marine	red

Joins (Combining Tables)

Joins unite records from two or more relational tables based on a relationship between specified columns.

- **INNER JOIN:** Returns only rows where there's a match in both tables.
- **OUTER JOIN:** Returns all rows from one table and matching rows from the other, using NULL for unmatched data.
    - **LEFT JOIN:** Prioritizes all rows from the left table.
    - **RIGHT JOIN:** Prioritizes all rows from the right table.
    - **FULL JOIN:** Returns all rows from both tables, whether they match or not.
- **CROSS JOIN:** Combines every row from the first table with every row from the second (Cartesian product).

SET Operations (Combining Result Sets)

SET operations merge the results of multiple SELECT queries. The queries must have the same number of columns with compatible data types.

- **UNION:** Combines results andremoves duplicates.
- **UNION ALL:** Combines resultsand keeps all duplicates.
- **INTERSECT:** Returnsonlytherows that are common to both result sets.
- **MINUS (or EXCEPT):** Returnsrows from the first query that are not present in the second.

SQL Functions (Data Processing)

SQL functions process input values to return a result.

Aggregate Functions (Group)

These functions operate on a set of rows and return a single summary value.

- **COUNT():** Gets the total number of rows.
- **SUM() / AVG():** Calculates the total sum or average of numeric values.
- **MAX() / MIN():** Finds the highest or lowest value in a set.

```
    create table sailorss(sid int,sname varchar(10),rating int,age float);
    Table created.
    SQL>descsailorss;
     Name                              Null? Type
     ------------------------------------------------------------------------
     SID                                    NUMBER(38)
     SNAME                                      VARCHAR2(10)
     RATING                                     NUMBER(38)
     AGE                                     FLOAT(126)

Table created.
SQL> insert into sailors(sid,sname,rating,age)values(22,'dustin',7,45.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(29,'brutus',1,33.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(31,'lubber',8,55.5);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(32,'andy',8,25.5);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(58,'rusty',10,35.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(64,'Horatio',7,35.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(71,'zorba',10,16.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(74,'horatio',9,35.0);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(85,'art',3,25.5);
1 row created.
SQL> insert into sailors(sid,sname,rating,age)values(95,'bob',3,63.5);
1 row created.
SQL> create table reserves(
2 sidint,
3 bidint,
4 day date);

Table

created.

SQL> insert into reserves(sid,bid,day)values(22,104,to_date('10-10-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(22,102,to_date('10-10-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(22,103,to_date('10-08-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(22,104,to_date('10-07-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(31,102,to_date('11-10-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(31,103,to_date('11-06-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(31,104,to_date('11-12-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(64,101,to_date('09-05-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(64,102,to_date('09-08-98','dd-mm-yy'));
1 row created.
SQL> insert into reserves(sid,bid,day)values(74,103,to_date('09-08-98','dd-mm-yy'));
1 row created.
SQL> create table boats(
2 bidint,
3 bname varchar(15),
4 color varchar(10));


Table created.
SQL> insert into boats(bid,bname,color)values(101,'interlake','blue');
```

```
1 row created.
SQL> insert into boats(bid,bname,color)values(102,'interlake','red');
1 row created.
SQL> insert into boats(bid,bname,color)values(103,'clipper','green');
1 row created.
SQL> insert into boats(bid,bname,color)values(104,'marine','red');
1 row created.
```

1.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.
```

2.Find all sailors with rating > 7

```
SQL> select sname from sailors where rating>7;
SNAME
------------
```

```
lubber

andy

rusty

zorba

horatio
```

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

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

SNAME

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

dustin

lubber

horatio
```

4.Find the sids of sailors who have reserved red boat

```
SQL> select distinct s.sname from sailorsjoin reserves r on s.sid=r.sid join boats b on r.bid=b.bid
where color='red';

SNAME

-------

Lubber

Dustin

Horatio
```

5.Find the names of sailors who have reserved red boat

```
select distinct r.sid from sailorsjoin reserves r on s.sid=r.sid join boats b on r.bid=b.bid where
color='red';

      SID

-------
```

```
    22
    31
    64
```

6.Find ages of Sailors whose name begin and end with b and has atleast 3 characters

```
SQL> select s.age from sailors s where s.sname like 'b%b' and length(s.sname)>=3;
   AGE
-------
  63.5
```

7.Find names of Sailors who have reserved red or green boat

```
SQL> select distinct s.sname from sailors s,reservesr,boats b where s.sid=r.sid and r.bid=b.bid
and b.color='red' union select distinct s.sname from sailors s,reservesr,boats b where s.sid=r.sid
and r.bid=b.bid and b.color='green';
SNAME
-------------
Horatio
dustin
horatio
lubber
```

8.Find names of sailors who have reserved red boat but not green boat

```
SQL> select distinct s.sname from sailors s,reservesr,boats b where s.sid=r.sid and r.bid=b.bid
and b.color='red' minus select distinct s.sname from sailors s,reservesr,boats b where s.sid=r.sid
and r.bid=b.bid and b.color='green';
SNAME
-------------
Horatio
```

9. Find names of Sailors who have reserved red and green boat

```
SQL>select distinct s.sname from sailors s,reservesr,boats b where s.sid=r.sid and r.bid=b.bid
and b.color='red' intersect select distinct s.sname from sailors s,reservesr,boats b where
s.sid=r.sid and r.bid=b.bid and b.color='green';

SNAME

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

dustin

lubber
```

10. Find names of Sailors who have reserved atleast one boat

```
SQL> select s.sname from sailors s join reserves r on s.sid=r.sid group by s.sid,s.sname having
count(r.bid)>=1;

SNAME

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

lubber

dustin

Horatio
```

11. Findsids of Sailors who have rating of 10 or reserved boat 104

```
SQL> select distinct s.sid from sailors s,reservesr,boats b where s.sid=r.sid and r.bid=b.bid and
s.rating=10 union select distinct s.sid from sailors s,reservesr,boats b where s.sid=r.sid and
r.bid=b.bid and r.bid=104;

       SID

- - - - - - -

        22

        31
```

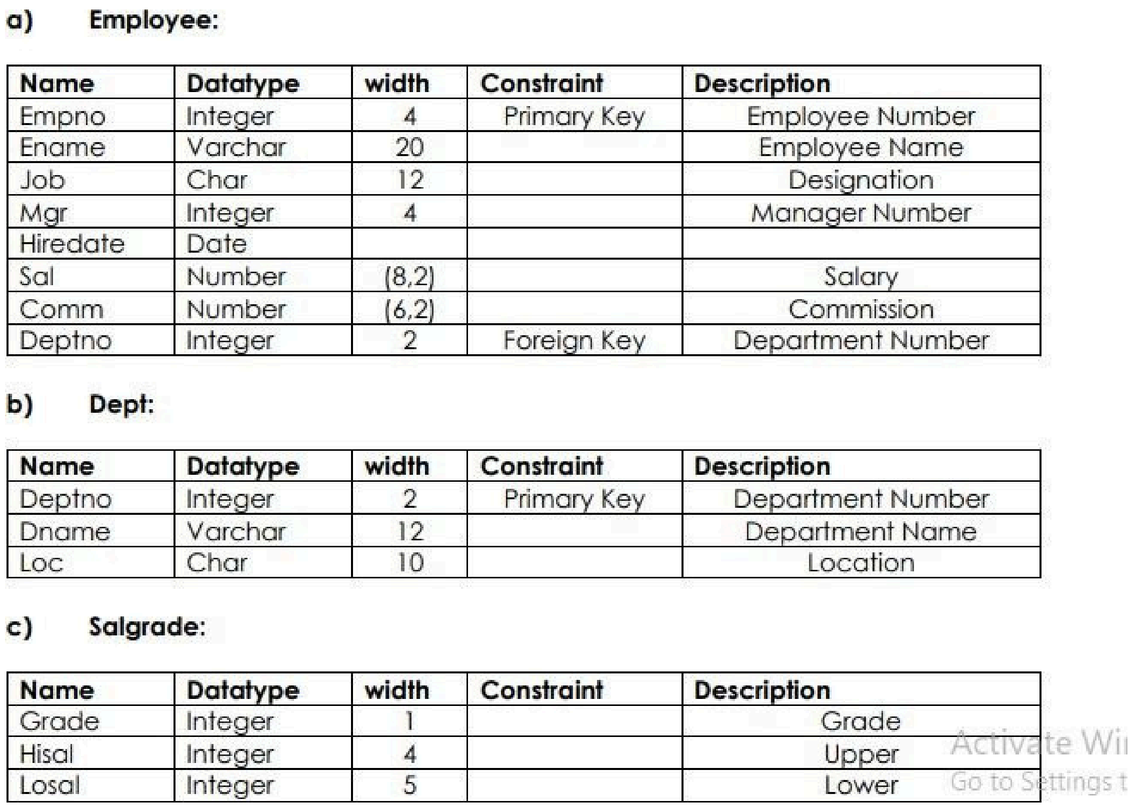
12. Find the names of Sailors who have not reserved a red boat

```
SQL> select s.sname from sailors s where s.sid not in(select r.sid from reserves r join boats b on
r.bid=b.bid where b.color='red');
```

```
SNAME
-------------
brutus
andy
rusty
zorba
horatio
art
Bob
```

WEEK – 5

Apply the concepts of Joins, SET operations and SQL functions on the following schema:



a) Employee:

Name	Datatype	width	Constraint	Description
Empno	Integer	4	Primary Key	Employee Number
Ename	Varchar	20		Employee Name
Job	Char	12		Designation
Mgr	Integer	4		Manager Number
Hiredate	Date			
Sal	Number	(8,2)		Salary
Comm	Number	(6,2)		Commission
Deptno	Integer	2	Foreign Key	Department Number

b) Dept:

Name	Datatype	width	Constraint	Description
Deptno	Integer	2	Primary Key	Department Number
Dname	Varchar	12		Department Name
Loc	Char	10		Location

c) Salgrade:

Name	Datatype	width	Constraint	Description
Grade	Integer	1		Grade
Hisal	Integer	4		Upper
Losal	Integer	5		Lower

Joins (Combining Tables)

Joins unite records from two or more relational tables based on a relationship between specified columns.

- **INNER JOIN:** Returns only rows where there's a match in both tables.
- **OUTER JOIN:** Returns all rows from one table and matching rows from the other, using NULL for unmatched data.
  - **LEFT JOIN:** Prioritizes all rows from the left table.
  - **RIGHT JOIN:** Prioritizes all rows from the right table.
  - **FULL JOIN:** Returns all rows from both tables, whether they match or not.
- **CROSS JOIN:** Combines every row from the first table with every row from the second (Cartesian product).

SET Operations (Combining Result Sets)

SET operations merge the results of multiple SELECT queries. The queries must have the same number of columns with compatible data types.

- **UNION:** Combines results andremoves duplicates.
- **UNION ALL:** Combines resultsand keeps all duplicates.
- **INTERSECT:** Returnsonlytherows that are common to both result sets.
- **MINUS (or EXCEPT):** Returnsrows from the first query that are not present in the second.

SQL Functions (Data Processing)

SQL functions process input values to return a result.

Aggregate Functions (Group)

These functions operate on a set of rows and return a single summary value.

- **COUNT():** Gets the total number of rows.
- **SUM() / AVG():** Calculates the total sum or average of numeric values.
- **MAX() / MIN():** Finds the highest or lowest value in a set.

EMP TABLE STRUCTURE AND SAMPLE DATA

```
CREATE TABLE EMP (
EMPNO INT PRIMARY KEY,
ENAMEVARCHAR(10),
JOBVARCHAR(9),
MGR INT,
HIREDATE DATE,
SAL DECIMAL(7,2),
COMM DECIMAL(7,2),
DEPTNO INT,
FOREIGN KEY (DEPTNO) REFERENCES DEPT(DEPTNO)
);


INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7566, 'JONES', 'MANAGER', 7839, '1981-04-02', 2975, NULL, 20);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7698, 'BLAKE', 'MANAGER', 7839, '1981-05-01', 2850, NULL, 30);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7782, 'CLARK', 'MANAGER', 7839, '1981-06-09', 2450, NULL, 10);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7788, 'SCOTT', 'ANALYST', 7566, '1987-04-19', 3000, NULL, 20);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7902, 'FORD', 'ANALYST', 7566, '1981-12-03', 3000, NULL, 20);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7844, 'TURNER', 'SALESMAN', 7698, '1981-09-08', 1500, 0, 30);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7900, 'JAMES', 'CLERK', 7698, '1981-12-03', 950, NULL, 30);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7654, 'MARTIN', 'SALESMAN', 7698, '1981-09-28', 1250, 1400, 30);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7499, 'ALLEN', 'SALESMAN', 7698, '1981-02-20', 1600, 300, 30);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7521, 'WARD', 'SALESMAN', 7698, '1981-02-22', 1250, 500, 30);
```

```
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7934, 'MILLER', 'CLERK', 7782, '1982-01-23', 1300, NULL, 10);

INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7876, 'ADAMS', 'CLERK', 7788, '1987-05-23', 1100, NULL, 20);
INSERT INTO EMP (EMPNO, ENAME, JOB, MGR, HIREDATE, SAL, COMM, DEPTNO)
VALUES (7658, 'SMITH', 'CLERK', 7902, '1980-12-17', 800, NULL, 20);
```

EMP TABLE QUERIES AND CONCISE OUTPUTS

1. Display all different job types.

```
SQL> SELECT DISTINCT JOB FROM EMP;
JOB
 ----
 CLERK
 SALESMAN
 MANAGER
 ANALYST
 PRESIDENT

5 rows selected.
```

2. List the details of all employees in deptno 10 and 20 in alphabetical order.

```
SQL> SELECT * FROM EMP WHERE DEPTNO IN (10,20) ORDER BY
ENAME; EMPNO ENAME JOB      SAL DEPTNO
 -------  ----- --------
 7782 CLARK MANAGER 2450 10
 7839 KING   PRESIDENT5000 10
 7934 MILLER CLERK       1300 10
 7902 FORD     ANALYST 3000 20
 7566 JONES MANAGER 2975 20
 7788 SCOTT ANALYST 3000 20
 7369 SMITH CLERK      800 20
7 rows selected
```

3. List the names of employees who have “th” or “ll” in their names

```
SQL> SELECT ENAME FROM EMP WHERE ENAME LIKE '%TH%' OR ENAME LIKE
'%LL%';
ENAME
```

```
---
ALLEN
SMITH
MILLER
3 rows selected.
```

4. **List the names, jobs and salaries of all employees who have a manager.**

```
SQL> SELECT ENAME, JOB, SAL FROM EMP WHERE MGR IS NOT NULL;

ENAME JOB        SAL

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

SMITH CLERK        800

ALLEN SALESMAN 1600

WARD SALESMAN 1250

JONES MANAGER      2975

   MARTIN SALESMAN 1250

BLAKE    MANAGER     2850

CLARK    MANAGER    2450

SCOTT ANALYST      3000

TURNER SALESMAN 1500

JAMES CLERK        950

FORD    ANALYST    3000

MILLER CLERK       1300

12 rows selected.
```

5. Give name remuneration of all employees.

```
SQL> SELECT ENAME, SAL + NVL(COMM,0) AS REMUNERATION FROM EMP;
ENAME REMUNERATION
---- ---------
SMITH       800
```

```
ALLEN      1900
WARD       1750
JONES     2975
MARTIN     2650
BLAKE      2850
CLARK      2450
SCOTT     3000
KING      5000
TURNER     1500
JAMES      950
FORD      3000
MILLER     1300
13 rows selected.
```

6. **List name and salary increased by 15% of all employees.**

```
SELECTENAME, SAL + 15 AS NEW_SALARY FROM EMP;
ENAMENEW_SALARY
- - - - - - - ------------
ALLEN        1615.00
WARD         1265.00
JONES       2990.00
MARTIN        1265.00
SMITH        815.00
BLAKE        2865.00
CLARK        2465.00
SCOTT       3015.00
KING       5015.00
TURNER        1515.00
ADAMS        1115.00
JAMES         965.00
FORD        3015.00
```

```
    MILLER        1315.00
```

7. Find all the employees who were hired during 1982.

```
SQL> SELECT ENAME, HIREDATE FROM EMP WHERE EXTRACT(YEAR FROM
HIREDATE)=1982;
ENAME HIREDATE
 ---- -------
 MILLER 23-JAN-82
1 row selected.
```

8. Display name, annual salary, commission of all salesmen whose monthly salary is greater than commission.

```
SQL> SELECT ENAME, SAL*12 AS ANNUAL_SAL, COMM FROM EMP WHERE
JOB='SALESMAN' AND SAL >NVL(COMM,0);
ENAME ANNUAL_SAL COMM

 ALLEN 19200      300
 WARD 15000       500
 TURNER18000       0
3 rows selected.
```

9. Produce the output as "smith has held the position of clerk in dept. 20 since 17-dec-80".

```
SQL> SELECT LOWER(ENAME) || ' has held the position of ' || LOWER(JOB) || ' in dept. ' ||
DEPTNO || ' since ' || TO_CHAR(HIREDATE,'DD-MON-YY')
 FROM EMP WHERE ENAME='SMITH';

LOWER(ENAME)||' HAS...'
 -------------------------------
 smith has held the position of clerk in dept. 20 since 17-DEC-80
1 row selected.
```

10. Find average salary and average total remuneration of all employees other than salesman.

```
SQL> SELECT ROUND(AVG(SAL),2) AS AVG_SAL, ROUND(AVG(SAL +
NVL(COMM,0)),2) AS AVG_TOTAL_REM FROM EMP WHERE JOB!='SALESMAN';

AVG_SAL AVG_TOTAL_REM
 ----- ----------------
 2853.00 2853.00
1 row selected.
```

11. Find maximum, minimum and average salaries in each department.

```
SQL> SELECT DEPTNO, MAX(SAL) AS MAX_SAL, MIN(SAL) AS MIN_SAL,
ROUND(AVG(SAL),2) AS AVG_SAL FROM EMP GROUP BY DEPTNO;
DEPTNO MAX_SAL MIN_SAL AVG_SAL
 10     5000    1300    2916.67
 20     3000     800    2261.67
 30     1600     950    1275.00
3 rows selected.
```

12. Find the maximum, minimum and average salaries in each job.

```
SQL> SELECT JOB, MAX(SAL), MIN(SAL), ROUND(AVG(SAL),2) FROM EMP GROUP
BY JOB;
JOB       MAX MIN AVG
 MANAGER 2975 2450 2758.33
 ANALYST 3000 3000 3000.00
 CLERK    1300 800 1016.67
 SALESMAN 1600 1250 1400.00
 PRESIDENT5000 5000 5000.00
5 rows selected.
```

13. Find the departments which have more than three employees.

```
SQL> SELECT DEPTNO, COUNT(*) AS CNT FROM EMP GROUP BY DEPTNO HAVING
COUNT(*)>3;
DEPTNO CNT
 30     5
1 row selected.
```

14. Display employee names and their respective department numbers.

```
SQL> SELECT ENAME, DEPTNO FROM EMP;
ENAME DEPTNO
 ---- ----
 SMITH 20
 ALLEN 30
```

```
13 rows selected.
```

15. Give the salary grades for all the employees.

```
SQL> -- Assuming salary_grade table or using CASE for illustration
 SQL> SELECT ENAME, SAL,
 CASE WHEN SAL<=1000 THEN 1 WHEN SAL<=2000 THEN 2 WHEN SAL<=3000 THEN
3 ELSE 4 END AS SAL_GRADE FROM EMP;

ENAME SAL SAL_GRADE
 SMITH 800 1
 ALLEN1600 2

13 rows selected.
```

16. Display the employee names who earn highest salary in each job.

```
SQL> SELECT ENAME, JOB, SAL FROM EMP WHERE (JOB, SAL) IN (SELECT JOB,
MAX(SAL) FROM EMP GROUP BY JOB);
ENAME JOB SAL
 ---·----· -----
 KING PRESIDENT 5000
 SCOTT ANALYST 3000
 MILLER CLERK 1300
 ALLEN SALESMAN 1600

4 rows selected.
```

17. Find the employee details whose salary is greater than blake's salary.

```
SQL> SELECT * FROM EMP WHERE SAL > (SELECT SAL FROM EMP WHERE
ENAME='BLAKE');

EMPNO ENAME JOB       SAL
 ------· ----- ---·
 7839 KING PRESIDENT 5000
 7788 SCOTT ANALYST 3000
 7902 FORD ANALYST 3000
3 rows selected.
```

18. Find employee details of employees who have the same job and salary as that cott.

```
SQL> SELECT * FROM EMP WHERE JOB = (SELECT JOB FROM EMP WHERE
ENAME='SCOTT') AND SAL = (SELECT SAL FROM EMP WHERE ENAME='SCOTT');

-- Only SCOTT matches in this dataset
 EMPNO ENAME JOB SAL
 7788 SCOTT ANALYST 3000
1 row selected.
```

19. Display the maximum salaries in accounting and research department.

```
SQL> -- Assuming dept 10=ACCOUNTING, dept 20=RESEARCH
 SQL> SELECT DEPTNO, MAX(SAL) FROM EMP WHERE DEPTNO IN (10,20) GROUP
BY DEPTNO;
DEPTNO MAX(SAL)
 10     5000
 20     3000
2 rows selected.
```

20. Display salary grades of all employees except of those employees whose salarygrade is 3 and 4.

```
SQL> SELECT ENAME, SAL,
 CASE WHEN SAL<=1000 THEN 1 WHEN SAL<=2000 THEN 2 WHEN SAL<=3000 THEN
3 ELSE 4 END AS SAL_GRADE
 FROM EMP WHERE CASE WHEN SAL<=1000 THEN 1 WHEN SAL<=2000 THEN 2
WHEN SAL<=3000 THEN 3 ELSE 4 END NOT IN (3,4);

ENAME SAL SAL_GRADE
SMITH 800 1
ALLEN1600 2
WARD 1250 2
6 rows selected.
```

21. Give the names and salaries of the employees whose salary is maximum in their respective departments.

```
SQL> SELECT ENAME, SAL FROM EMP e WHERE SAL = (SELECT MAX(SAL) FROM
EMP WHERE DEPTNO = e.DEPTNO);

ENAME SAL
 KING 5000
 FORD 3000
 ALLEN1600

3 rows selected.
```

22. List the employees whose salary is greater than the salaries of all employees who are working as salesman.

```
SQL> SELECT ENAME, SAL FROM EMP WHERE SAL > ALL (SELECT SAL FROM EMP
WHERE JOB='SALESMAN');

ENAME SAL
 KING 5000
 SCOTT 3000
 FORD 3000

3 rows selected.
```

23. Write a query which will return the day of the week entered in the format of sysdate.

```
SQL> SELECT TO_CHAR(TO_DATE('21-07-2025','DD-MM-YYYY'),'DAY') FROM DUAL;

TO_CHAR(...)
 -----------
 MONDAY

1 row selected.
```

24. Find the difference between highest and lowest salaries

```
SQL> SELECT MAX(SAL)-MIN(SAL) AS SAL_DIFF FROM EMP;

SAL_DIFF
 -----
 4200

1 row selected.
```

25. Generate the output as smith – clerk.

```
SQL> SELECT LOWER(ENAME) || ' - ' || LOWER(JOB) FROM EMP WHERE
ENAME='SMITH';
```

```
LOWER(ENAME)||' - '||LOWER(JOB)
 - - - - - - - - - - - - - - - - - - - - - -
 smith – clerk
1 row selected.
```