

DHANEKULA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GANGURU

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



DATABASE MANAGEMENT SYSTEMS

LAB MANUAL

CODE : D23C213
CLASS : II B.TECH
SEM : II
STAFF : Mr. K. SRIKANTH

DATABASE MANAGEMENT SYSTEMS

INDEX

S. No	Exercise	Experiment Name	Page No.
1	EXE - 1	Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.	1-7
2	EXE - 2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: - Select the roll number and name of the student who secured fourth rank in the class.	8-13
3	EXE - 3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.	14-19
4	EXE - 4	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)	20-28
5	EXE - 5	<p>i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)</p> <p>ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.</p>	29-32
6	EXE - 6	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.	33-36
7	EXE - 7	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.	37-40
8	EXE - 8	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.	41-42
9	EXE - 9	Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.	43-44
10	EXE - 10	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.	45-46

11	EXE - 11	Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers	47-48
12	EXE - 12	Create a table and perform the search operation on table using indexing and non-indexing techniques.	49-52

EXPERIMENT: 1

1

Aim: Queries for Creating, Dropping, and Altering Tables and insert row into a table (use constraints while creating tables) examples using Select Command.

Procedure:**1. Creation of emp & dept table in Sql:**

```
SQL>create table dept(  
    deptno number(2,0) primary key,  
    dname varchar2(14) NOT NULL,  
    loc varchar2(13) NOT NULL,  
);
```

Table created.

```
SQL>create table emp(  
    empno number(4,0),  
    ename varchar2(10) NOT NULL,  
    job varchar2(9) NOT NULL,  
    mgr number(4,0),  
    hiredate date,  
    sal number(7,2) NOT NULL,  
    comm number(7,2),  
    deptno number(2,0),  
    constraint pk_emp primary key (empno),  
    constraint fk_deptno foreign key (deptno) references dept (deptno)  
);
```

Table created.

2. View Structure/schema of emp & dept table in sql:

```
SQL> select *from emp;  
no rows selected
```

```
SQL> select *from dept;  
no rows selected
```

SQL> desc emp;

2

Name	Null?	Type

EMPNO	NOT NULL	NUMBER(4)
ENAME		VARCHAR2(10)
JOB		VARCHAR2(9)
MGR		NUMBER(4)
HIREDATE		DATE
SAL		NUMBER(7,2)
COMM		NUMBER(7,2)
DEPTNO		NUMBER(2)

SQL> desc dept;

Name	Null?	Type

DEPTNO	NOT NULL	NUMBER(2)
DNAME		VARCHAR2(14)
LOC		VARCHAR2(13)

2. Insert the values in emp & dept table in sql:

There are several ways to insert the values in the existing table

Query to insert single record in the existing table:

SQL> insert into dept(deptno,dname,loc) values(20,'admin','hyd');

1 row created.

Query to insert multiple records in the existing table:

SQL>insert into dept values(&deptno,'&dname','&loc');

Enter value for deptno: 10

Enter value for dname: sales

Enter value for loc: vijayawada

old 1: insert into dept values(&deptno,'&dname','&loc')

new 1: insert into dept values(10,'sales','vijayawada')

1 row created.

SQL>/

Enter value for deptno: 20

Enter value for dname: admin

Enter value for loc: hyd

old 1: insert into dept values(&deptno,'&dname','&loc')

1 row created.

SQL> /

Enter value for deptno: 30

Enter value for dname: marketing

Enter value for loc: vzg

old 1: insert into dept values(&deptno,'&dname','&loc')

new 1: insert into dept values(30,'marketing','vzg')

1 row created.

4. Select Command: this command is used to print the record from the existing table.

View all records in dept table:

SQL> select *from dept;

DEPTNO	DNAME	LOC
10	sales	vijayawada
20	admin	hyd
30	marketing	vzg

View records basing on given criteria on specific column.

1. View single column from existing table.

SQL>select dname from dept;

DNAME

Sales

Admin

Marketing

2. View specific record(s) from existing table based on given condition.

4

SQL> select *from dept where dname='sales';

DEPTNO	DNAME	LOC
10	sales	vijayawada

Types of SQL Commands:

DDL: DDL Commands (Data Definition Language)

1. CREATE 2. DESC 3. ALTER 4. DROP 5. TRUNCATE 6. RENAME

DML Commands (Data Manipulation Language)

1. SELECT 2. INSERT 3. UPDATE 4. DELETE

TCL(Transaction Control Language)

1. COMMIT 2. ROLLBACK 3. SAVEPOINT

DCL Commands (Data Control Language)

1. GRANT 2. REVOKE

1. CREATE:

CREATE TABLE: This is used to create a new relation and the corresponding

Syntax: CREATE TABLE relation_name (field_1 data_type(Size),field_2 data_type(Size), ...);

Example:

SQL>CREATE TABLE Student (id number, name varchar2(10));

RESULT: Table created.

2. DESC: It is used to describe a schema as well as to retrieve rows from table in descending order.

5

SYNTAX: DESC

EX: SQL> DESC EMP1;

NAME	NULL?	TYPE
-----	-----	-----
EMPNO	NOT NULL	NUMBER(10)
ENAME		VARCHAR2(15)
JOB		CHAR(10)
DEPTNAME		VARCHAR2(10)
DEPTNO		NUMBER(9)
HIREDATE		DATE
SALARY		NUMBER(8)
EXP		NUMBER(5)

3. ALTER: This is used for add, remove or modify the structure of the existing table

(a) ALTER TABLE ...ADD...: This is used to add some extra fields into existing relation.

Syntax: ALTER TABLE relation_name ADD(new field_1 data_type(size), new field_2 data_type(size),...);

Example : SQL>ALTER TABLE emp1 ADD(Address CHAR(10));

TABLE ALTERED.

(b) ALTER TABLE...MODIFY...: This is used to change the width as well as data type of fields of existing relations.

Syntax: ALTER TABLE relation_name MODIFY (field_1 newdata_type(Size), field_2 newdata_type(Size),..., field_newdata_type(Size));

Example:

SQL>ALTER TABLE emp1 MODIFY(ename VARCHAR2(20), salary NUMBER(5));

TABLE ALTERED.

SQL> DESC EMP1;

NAME	NULL?	TYPE
-----	-----	-----
EMPNO	NOT NULL	NUMBER(10)
ENAME		VARCHAR2(20)
JOB		CHAR(10)
DEPTNAME		VARCHAR2(10)
DEPTNO		NUMBER(9)
HIREDATE		DATE
SALARY		NUMBER(5)
EXP		NUMBER(5)
ADDRESS		CHAR(10)

4. DROP TABLE: This is used to delete the structure of a relation. It permanently deletes the table.

Syntax: DROP TABLE tablename;

Example:

SQL>DROP TABLE EMP1;

Table dropped;

DROP: this command is used to remove the data from the existing table

DROP COLUMN IN TABLE

Syntax:

To DROP A COLUMN in an existing table, the Oracle ALTER TABLE **syntax is:**

ALTER TABLE table_name DROP COLUMN column_name;

Example customers DROP COLUMN customer_name;

SQL> ALTER TABLE customers DROP COLUMN customer_name;

5. RENAME: It is used to modify the name of the existing database object.

Syntax: RENAME old_table_name TO new_table_name;

Example:

SQL>RENAME EMP1 TO EMP2;

Table renamed.

6. TRUNCATE: This command will remove the data permanently. But structure will not be removed.

7

Syntax: TRUNCATE TABLE <Table name>

Example :

TRUNCATE TABLE EMP1;

EXPERIMENT: 2

8

QUERIES (ALONG WITH SUB QUERIES) USING ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT**SOLUTION:****To Create employee table:**

```
Sql> create table employee(  
    Fname varchar2(20),  
    Lname varchar2(20),  
    Ssn number(4) primary key,  
    B_date date,  
    Address varchar2(30),  
    Gender char(1),  
    Salary number(7,2),  
    Super_ssn references employee(ssn),  
    Dno number(4)  
);
```

Table created.

```
SQL> INSERT INTO EMPLOYEE
```

```
VALUES('SMITH',NULL,1111,'03-NOV-2016','BJD','M',2000,NULL,10)
```

1 row created.

```
SQL> INSERT INTO EMPLOYEE
```

```
VALUES('ALLEN',NULL,2222,'03-NOV-2016','SBC','M',3000,1111,20)
```

1 row created.

```
SQL> INSERT INTO EMPLOYEE
```

```
VALUES('MARTIN',NULL,3333,'03-NOV-2016','HYD','M',4000,1111,30)
```

1 row created.

Like this we can insert the values into the table. To view data in the table following query is used.

SQL> SELECT *FROM EMPLOYEE;

FNAME	LNAME	SSN	BDATE	ADDRESS	G	SALARY	SUPER_SSN	DNO
SMITH		1111	01-JAN-06	BZA	M	2000		10
ALLEN		2222	12-DEC-04	SBC	M	3000	1111	20
MARTIN		3333	15-DEC-07	HYD	M	4000	1111	20
JONES		4444	28-SEP-05	TNU	M	1500	2222	10
BLAKE		5555	04-SEP-04	VZA	M	2500	2222	10
TURNER		6666	21-OCT-99	GNT	M	6000	3333	20

6 rows selected.

Inserting values in the dependent table as follows

SQL> INSERT INTO DEPENDENT VALUES (1111,'SMITH','G')

1 row is created.

SQL> INSERT INTO DEPENDENT VALUES (2222,'POOJA','F')

1 row is created.

SQL> INSERT INTO DEPENDENT VALUES (3333,'MARTIN','M')

1 row is created.

SQL> INSERT INTO DEPENDENT VALUES (3333,'RAJA','M')

1 row is created.

To Create dependent table:

```
SQL> CREATE TABLE DEPENDENT (
    ESSN NUMBER (4) REFERENCES EMPLOYEE (SSN),
    DEPENDENT_NAME VARCHAR2 (20),
    GENDER CHAR (1),
    B_DATE DATE,
    RELATIONSHIP VARCHAR2 (20),
    PRIMARY KEY (ESSN, DEPENDENT_NAME)
);
```

Table created.

To view data in the dependent table as follows.

10

SQL>SELECT * FROM DEPENDENT;

ESSN	DEPENDENT_NAME	G	B_DATE	RELATIONSHIP
1111	SMITH	M		
2222	POOJA	F		
3333	MARTIN	M		
3333	RAJA	M		

1. ALL:

Retrieve the names of employees whose salary is greater than the salary of all the employees in department 10

SQL> SELECT FNAME, LNAME FROM EMPLOYEE WHERE SALARY> ALL (SELECT SALARY FROM EMPLOYEE WHERE DNO=10);

FNAME	LNAME
ALLEN	
MARTIN	
TURNER	

2. ANY

Retrieve the names of employees whose salary is greater than the salary of any one of the employees in department 10

SQL> SELECT FNAME, LNAME FROM EMPLOYEE WHERE SALARY> ANY(SELECT SALARY FROM EMPLOYEE WHERE DNO=10);

FNAME	LNAME
TURNER	
MARTIN	
ALLEN	
BLAKE	
SMITH	

3. IN

11

Retrieve the name of each employee who has a dependent with the firstname and same gender as the employee

```
SQL> SELECT e.FNAME, e.LNAME FROM EMPLOYEE e WHERE e.SSN IN ( SELECT
      ESSN FROM DEPENDENT WHERE e.GENDER=GENDER AND e.FNAME =
      DEPENDENT_NAME);
```

FNAME	LNAME

SMITH	
MARTIN	

4. EXISTS

Retrieve the name of each employee who has a dependent with the firstname and same gender as the employee

```
SQL> SELECT e.FNAME, e.LNAME FROM EMPLOYEE e WHERE EXISTS (SELECT
      *FROM DEPENDENT WHERE e.SSN=ESSN AND e.GENDER=GENDER AND
      e.FNAME = DEPENDENT_NAME);
```

FNAME	LNAME

SMITH	
MARTIN	

5. NOT EXISTS

Retrieve the names of employees who have no dependents

```
SQL> SELECT FNAME, LNAME FROM EMPLOYEE WHERE NOT EXISTS (SELECT *
      FROM DEPENDENT WHERE SSN=ESSN);
```

FNAME	LNAME

ALLEN	

SQL Constraints

SQL constraints are used to specify rules for the data in a table.

Constraints are used to limit the type of data that can be insert into a table. This ensures the accuracy and reliability of the data in the table. If there is any violation between the constraint and the data action, the action is aborted.

Constraints can be column level or table level. Column level constraints apply to a column, and table level constraints apply to the whole table.

The following constraints are commonly used in SQL:

- **NOT NULL** - Ensures that a column cannot have a NULL value

Example:

```
SQL> create table person1 (id int, name varchar2 (10) not null, age int);
```

Table created.

- **UNIQUE** - Ensures that all values in a column are different

Example:

```
SQL> create table person(id int unique, name varchar2(10),age int);
```

Table created.

- **PRIMARY KEY** - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table

Example:

```
SQL> create table emp1(id number(10) primary key, name varchar2(10),sal int);
```

Table created.

- **FOREIGN KEY** - Uniquely identifies a row/record in another table
 - A FOREIGN KEY is a key used to link two tables together.
 - A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.
 - The table containing the foreign key is called the child table, and the table containing the candidate key is called the referenced or parent table.

Example:

```
SQL> create table emp2 (eid int, city varchar2(10),foreign key(eid) references emp1(id));
```

Table created.

- **CHECK** - Ensures that all values in a column satisfies a specific condition

Example:

```
SQL> CREATE TABLE person1( ID int ,Age int, City varchar(10), CONSTRAINT chk  
CHECK(Age>=18 AND City='vja');
```

Table created.

- **DEFAULT** - Sets a default value for a column when no value is specified.
 - The DEFAULT constraint is used to provide a default value for a column.
 - The default value will be added to all new records IF no other value is specified.

SQL DEFAULT on CREATE TABLE

```
SQL> create table emp(id number(10),name varchar2(10),city varchar2(10) default 'vja');
```

Table created.

EXPERIMENT: 3

14

**QUERIES USING AGGREGATE FUNCTIONS (COUNT, SUM, AVG, MAX AND MIN)
GROUP BY, HAVING and Creation and dropping of Views.**

SOLUTION:

1. COUNT: Calculate the number of employees in dept 20.

SQL> SELECT COUNT (*) NO_EMP FROM EMP WHERE DEPTNO=20;

NO_EMP
5

2. SUM: Calculate the total salaries for each dept

SQL> SELECT DEPTNO, SUM (SAL) FROM EMP GROUP BY DEPTNO

DEPTNO	SUM(SAL)
30	9400
20	10875
10	8750

3. AVG: Calculate the average salaries for each dept

SQL> SELECT DEPT_NO, AVG (SAL) FROM EMP GROUP BY DEPT_NO;

DEPT_NO	AVG(SAL)
30	1566.66667
20	2175
10	2916.66667

4. MAX: Calculate the maximum salary for each dept

SQL> SELECT DEPTNO, MAX (SAL) FROM EMP GROUP BY DEPTNO;

DEPTNO	MAX(SAL)
30	2850
20	3000
10	5000

5. MIN

15

Calculate the minimum salary for each dept

SQL> SELECT DEPTNO, MIN(SAL) FROM EMP GROUP BY DEPTNO

DEPTNO MIN(SAL)

```
-----
30      950
20      800
10     1300
```

6. GROUP BY:

The GROUP BY clause is a SQL command that is used to **group rows that have the same values**.

The GROUP BY clause is used in the SELECT statement .Optionally it is used in conjunction with aggregate functions to produce summary reports from the database.

GROUP BY Syntax

SELECT statements... GROUPBY column_name1[column_name2,...];

Grouping using a Single Column:

Create a table called data with gender column and values as male and female.

SQL> select * from data;

GENDER

```
-----
male
female
female
female
female
female
male
male
male
female
male
male
female
male
male
female
```

16 rows selected.

SQL> select gender from data GROUP BY gender;

16

GENDER

male

female

SQL> select count (gender), gender from data GROUP BY gender;

COUNT (GENDER) GENDER

8 male

8 female

Grouping using Multiple Columns

Syntax

SELECT Column1, Column2, AGGREGATE_FUNCTION (Column3) FROM TABLE1 **GROUPBY**

Column1, Column2

Examples :

SQL> select * from emp;

ID	NAME	DEPT	SAL
-----	-----	-----	-----
1	a	cse	1000
2	b	ece	2000
3	c	eee	3000
4	d	cse	4000
1	z	cse	5000
5	a	ece	6000
6	e	ece	7000
2	b	eee	9000

8 rows selected.

SQL> select id, name from emp GROUP BY id, name;

ID NAME

3 c

4 d

1 a

2 b

5 a

1 z

6 e

7 rows selected.

7. HAVING

17

- The HAVING clause was added to SQL because the WHERE keyword could not be used with aggregate functions.
- The WHERE clause places conditions on the selected columns, whereas the HAVING clause places conditions on groups created by the GROUP BY clause.
- The HAVING clause must follow the GROUP BY clause in a query and must also precede the ORDER BY clause if used

HAVING Syntax

SELECT *column_name(s)* **FROM** *table_name* **WHERE** *condition* **GROUP BY** *column_name(s)*
HAVING *condition*

SQL> select * from emp;

ID	NAME	DEPT	SAL
1	a	cse	1000
2	b	ece	2000
3	c	eee	3000
4	d	cse	4000
5	e	ece	5000

SQL> select count (id), dept from emp GROUP BY dept having count (id)>1;

COUNT(ID)	DEPT
2	cse
2	ece

SQL> select * from emp;

ID	NAME	DEPT	SAL
1	a	cse	1000
2	b	ece	2000
3	c	eee	3000
4	d	cse	4000
5	e	ece	5000

SQL> select max (sal), dept from emp GROUP BY dept;

18

MAX(SAL) DEPT

-----	-----
4000	cse
3000	eee
5000	ece

SQL> select max(sal),dept from emp GROUP BY dept having max(sal)>3000;

MAX(SAL) DEPT

-----	-----
4000	cse
5000	ece

8. View :

- Views in SQL are considered as a virtual table. A view also contains rows and columns.
- To create the view, we can select the fields from one or more tables present in the database.
- A view can either have specific rows based on certain condition or all the rows of a table.

SQL> select *from emp;

ENO	ENAME	SALARY	LOC
-----	-----	-----	-----

101	ali	15000	vja
102	haji	20000	hyd
103	mohammad	42000	vja
104	ravi	23000	gnt
105	irfath	50000	hyd

SQL> create VIEW hyd as select *from emp where loc='hyd';

View created.

SQL> select *from hyd;

ENO	ENAME	SALARY	LOC
-----	-----	-----	-----

102	haji	20000	hyd
105	irfath	50000	hyd

SQL> drop VIEW hyd;

View dropped.

19

SQL> select *from hyd;

select *from hyd

*

ERROR at line 1:

ORA-00942: table or view does not exist

EXPERIMENT: 4

20

QUERIES USING CONVERSION FUNCTIONS (TO_CHAR, TO_NUMBER AND TO_DATE), STRING FUNCTIONS (CONCATENATION, LPAD, RPAD, LTRIM, RTRIM, LOWER, UPPER, INITCAP, LENGTH, SUBSTR AND INSTR), DATE FUNCTIONS (SYSDATE, NEXT_DAY, ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN, LEAST, GREATEST, TRUNC, ROUND, TO_CHAR)

SQL> select *from emp;

ENO	ENAME	SALARY	LOC
101	ali	15000	vja
102	haji	20000	hyd
103	mohammad	42000	vja
104	ravi	23000	gnt
105	irfath	50000	hyd

a) Conversion Functions:

1. to_char: to_char is used to convert the attribute values to char.

SQL> select to_char(salary,'\$99999.99') from emp;

```
TO_CHAR(SALARY)
-----
$15000.00
$20000.00
$42000.00
$23000.00
$50000.00
```

SQL> SELECT TO_CHAR (123.4567, '99999.9') FROM DUAL;

```
TO_CHAR (
-----
123.5
```

SQL> SELECT TO_CHAR(123.4567, '99999.99') FROM DUAL;

```
TO_CHAR(1
-----
123.46
```

SQL> SELECT TO_CHAR(1234.56789,'9,999.00') FROM DUAL;

TO_CHAR(1

1,234.57

SQL> SELECT TO_CHAR(SYSDATE, 'YYYY/MM/DD') FROM DUAL;

TO_CHAR(SY

2021/07/09

SQL> SELECT TO_CHAR (SYSDATE, 'DD/MM/YYYY') FROM DUAL;

TO_CHAR(SY

09/07/2021

SQL> SELECT TO_CHAR (23, '000099') FROM DUAL;

TO_CHAR

000023

SQL> SELECT TO_CHAR (23, '0000999') FROM DUAL;

TO_CHAR(

0000023

SQL> SELECT TO_CHAR (23, '00009') FROM DUAL;

TO_CHA

00023

SQL> SELECT TO_CHAR (23, '00000') FROM DUAL;

TO_CHA

00023

SQL> SELECT TO_CHAR (234.5678, '00.00') FROM DUAL;

TO_CHA

#####

SQL> SELECT TO_CHAR (234.5678, '000.000') FROM DUAL;

TO_CHAR(

234.568

SQL> SELECT TO_CHAR(2345.234566, '1,23.000') FROM DUAL;

SELECT TO_CHAR(2345.234566, '1,23.000') FROM DUAL

*

ERROR at line 1:

ORA-01481: invalid number format model

SQL> SELECT TO_CHAR (2345.2345, '9,000.00') FROM DUAL;

TO_CHAR(2

2,345.23

SQL> SELECT TO_CHAR (2345.2345, '\$9,000.00') FROM DUAL;

TO_CHAR(23

\$2,345.23

2. to_number: to_number is used to convert the attribute value to number.

SQL> SELECT TO_NUMBER('1210.73', '9999.99') FROM DUAL;

TO_NUMBER('1210.73','9999.99')

1210.73

3. to_date: to_date is used for convert and display the attribute values as date.

SQL> select to_date('01-01-2020', 'MM-DD-YYYY') from dual;

TO_DATE(

01-JAN-20

b) String functions:

1. **Concatenation:** CONCAT is used to add two attribute values such as string.

SQL> select concat (eno, loc) from emp;

CONCAT(ENO,LOC)

101vja

102hyd

103vja

104gnt

105hyd

2. **lpad:** LPAD() function is used to padding the left side of a string with a specific set of characters.

SQL> select lpad(ename,10,'*') from emp;

LPAD(ENAME,10,'*')

*****ali

*****haji

**mohammad

*****ravi

****irfath

3. **rpadd:** RPAD() function is used to padding the right side of a string with a specific set of characters.

SQL> select rpad(ename,10,'*') from emp;

RPAD(ENAME,10,'*')

ali*****

haji*****

mohammad**

ravi*****

irfath****

4. **ltrim:** LTRIM() function is used to remove all specified characters from the left end side of a string

SQL> select ltrim('***hi*****','*') from dual;**

```
LTRIM('***
-----
hi*****
```

5. **rtrim:** RTRIM() function is used to remove all specified characters from the left end side of a string

SQL> select rtrim('***hi*****','*') from dual;**

```
RTRIM('*
-----
*****hi
```

6. **lower:** lower() function is used to convert the attribute value in to lower case.

SQL> select lower(ename) from emp;

```
LOWER(ENAM
-----
ali
haji
mohammad
ravi
irfath
```

7. **upper:** upper() function is used to convert the attribute values in to upper case.

SQL> select upper(ename) from emp;

```
UPPER(ENAM
-----
ALI
HAJI
MOHAMMAD
RAVI
IRFATH
```

8. **initcap:** initcap() is used to convert the attribute values first character in capital letter.

SQL> select initcap (ename) from emp;

INITCAP(EN

Ali

Haji

Mohammad

Ravi

Irfath

9. **length:** length() function is used to calculate the length of the given attribute.

SQL> select ename,length(ename) from emp;

ENAME LENGTH(ENAME)

ali 3

haji 4

mohammad 8

ravi 4

irfath 6

10. **substr:** substr() function is used to find the substring of the given attribute value. It returns size-1 of the given string/ attribute as a sub string.

SQL> select ename, substr(ename,4) from emp;

ENAME SUBSTR(ENAME,4)

ali

haji i

mohammad ammad

ravi i

irfath ath

11. **instr:** instr() function returns the location of starting position of the sub string in the existing value.

SQL> select instr('welcome to CRRCOE','to') from dual;

```
INSTR('WELCOMETO CRRCOE','TO')
```

```
-----
```

```
9
```

c) Date functions:

1. **Sysdate()**: sysdate() function returns the current system date.

```
SQL> select sysdate from dual;
```

```
SYSDATE
```

```
-----
```

```
28-APR-21
```

2. **next_day()**: it returns the date of next coming day .

```
SQL> select next_day(sysdate,'sunday') from dual;
```

```
NEXT_DAY(
```

```
-----
```

```
02-MAY-21
```

3. **add_months()**: it returns the next date after adding number of months in the arguments.

```
SQL> select add_months(sysdate,5) from dual;
```

```
ADD_MONTH
```

```
-----
```

```
28-SEP-21
```

4. **last_day()**: The LAST_DAY() function takes a date value as argument and returns the last day of month in that date

```
SQL> select last_day(sysdate) from dual;
```

```
LAST_DAY(
```

```
-----
```

```
30-APR-21
```

```
SQL> select last_day('02-FEB-2020') from dual;
```

```
LAST_DAY(
```

```
-----
```

29-FEB-20

27

5. **months_between()**: it returns the numbers of months between given two dates.

SQL> select months_between('02-feb-2021','02-feb-2020') from dual;

MONTHS_BETWEEN('02-FEB-2021','02-FEB-2020')

12

SQL> select months_between(sysdate,'02-feb-2020') from dual;

MONTHS_BETWEEN(SYSDATE,'02-FEB-2020')

14.8600769

6. **least()**: it returns least value from the given argument or attributes.

SQL> select least(300,450,100,440) from dual;

LEAST(300,450,100,440)

100

7. **greatest()**: it returns maximum values from the given arguments or attributes in the relation.

SQL> select greatest(300,450,100,440) from dual;

GREATEST(300,450,100,440)

450

8. **trunc()**: The TRUNC() function returns a DATE value truncated to a specified unit.

SQL> select trunc(sysdate,'mm') from dual;

TRUNC(SYS

01-APR-21

SQL> select trunc(sysdate,'yyyy') from dual;

TRUNC(SYS

01-JAN-21

28

9. **round()**: Round function round a number to a specified length or precision.

SQL> select round(12.49,0) from dual;

ROUND(12.49,0)

12

SQL> select round(12.51,0) from dual;

ROUND(12.51,0)

13

10. **to_char()**: it convert the given date type attribute values to text and return the date in the specific format.

SQL> select to_char(sysdate,'yyyy-mm-dd') from dual;

TO_CHAR(SY

2021-04-28

EXPERIMENT: 5

i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found).

ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block..

i). We have to create the student table and insert the records in to the table as follows:

SQL> create table student(sid number(10),sname varchar2(20),rank varchar(10));

Table created.

SQL> insert into student values(501,'Ravi','second');

1 row created.

SQL> insert into student values(502,'Raju','third');

1 row created.

SQL> insert into student values(503,'Ramu','');

1 row created.

SQL> select *from student;

SID	SNAME	RANK
501	Ravi	second
502	Raju	third
503	Ramu	

PL/SQL CODE:

Dept of CSE

SQL>ed 5a

30

Enter the following code into the text editor and save the file with .sql format

```
set serveroutput on;
declare
    temp1 number(10);
    temp2 varchar2(10);

begin
    select sid,sname into temp1,temp2 from student where rank='first';
    dbms_output.put_line('Student No:'|| temp1 ||' Name:'||temp2||' got first
rank');
exception
when no_data_found then
    dbms_output.put_line('*****');
    dbms_output.put_line('# Error: there is no student got first rank');
end;
/
```

SQL> @5a;

Error: there is no student got first rank

PL/SQL procedure successfully completed.

SQL> update student set rank='first' where sid=503;
1 row updated.

SQL> select *from student;

SID	SNAME	RANK
501	Ravi	second
502	Raju	third
503	Ramu	first

SQL> @5a

Student No:503 Name:Ramu got first rank

PL/SQL procedure successfully completed.

ii)

SQL> select *from student;

SID SNAME	RANK
501 Ravi	second
502 Raju	third
503 Ramu	first

PL/SQL CODE:

SQL>ed 5b

Enter the following code into the text editor and save the file with .sql format

set serveroutput on;

DECLARE

sno student.sid%type;
name student.sname%type;
srnk student.rank%type;

BEGIN

sno := &sno;
name := '&name';
srnk := '&srnk';
INSERT into student values(sno,name,srnk);
dbms_output.put_line('One record inserted');
COMMIT;
-- adding savepoint
SAVEPOINT s1;
-- second time asking user for input
sno := &sno;
name := '&name';
srnk := '&srnk';
INSERT into student values(sno,name,srnk);
dbms_output.put_line('One record inserted');
ROLLBACK TO SAVEPOINT s1;

END;

/

SQL> @5b;

SQL> @5b

Enter value for sno: 504

old 7: sno := &sno;

new 7: sno := 504;

Enter value for name: ali

old 8: name := '&name';

new 8: name := 'ali';

Enter value for srnk: first

old 9: srnk := '&srnk';

new 9: srnk := 'first';

Enter value for sno: 505

old 16: sno := &sno;

new 16: sno := 505;

Enter value for name: haji

old 17: name := '&name';

new 17: name := 'haji';

Enter value for srnk: third

old 18: srnk := '&srnk';

new 18: srnk := 'third';

One record inserted

One record inserted

PL/SQL procedure successfully completed.

SQL> select *from student;

SID	SNAME	RANK
501	Ravi	second
502	Raju	third
503	Ramu	first
504	ali	first

EXPERIMENT: 6

Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

A. NESTED IF:

A nested if-then is an if statement that is the target of another if statement. Nested if-then statements mean an if statement inside another if statement

Syntax:-

```
if (condition1) then
    -- Executes when condition1 is true
    if (condition2) then
        -- Executes when condition2 is true
    end if;
end if;
```

PL/SQL CODE: PL/SQL Program to find biggest of three number using nested if.

SQL>ed 6a

Enter the following code into the text editor and save the file with .sql format

```
declare
    a number:=10;
    b number:=12;
    c number:=5;
begin
    dbms_output.put_line('a'||a||' b'||b||' c'||c);
    if a>b AND a>c then
        dbms_output.put_line('a is greatest');
    else
        if b>a AND b>c then
            dbms_output.put_line('b is greatest');
        else
            dbms_output.put_line('c is greatest');
        end if;
    end if;
end;
/
```

SQL> @6a

a=10 b=12 c=5

b is greatest

PL/SQL procedure successfully completed.

B. CASE and CASE Expression : **CASE statement** selects one sequence of statements to execute. However, to select the sequence, the **CASE** statement uses a selector rather than multiple Boolean expressions. A selector is an expression, the value of which is used to select one of several alternatives.

Syntax

CASE selector

WHEN 'value1' THEN S1;

WHEN 'value2' THEN S2;

WHEN 'value3' THEN S3;

...

ELSE Sn; -- default case

END CASE;

SQL> create table emp(eno number(5), ename varchar2(10), loc varchar(10), salary number(10,2));

Table created.

SQL> insert into emp values(101,'ali','vja',15000);

1 row created.

SQL> insert into emp values(102,'ravi','hyd',25000);

1 row created.

SQL> insert into emp values(103,'raju','gnt',35000); ;

1 row created.

SQL> insert into emp values(104,'rakesh','vja',45000);

1 row created.

SQL> select *from emp;

ENO	ENAME	LOC	SALARY
101	ali	vja	15000
102	ravi	hyd	25000
103	raju	gnt	35000
104	rakesh	vja	45000

Example of CASE Expression:

Dept of CSE

SQL> select loc, case(loc) when 'vja' then salary+2000 when 'hyd' then salary+1000 else salary
end "rev_salary" from emp;

35

LOC	rev_salary

vja	17000
hyd	26000
gnt	35000
vja	47000

PL/SQL CODE: PL/SQL CODE to demonstrate CASE

SQL> ed 6b

```
set serveroutput on;
declare
grade char(1);
begin
grade:='&grade';
case
    when grade='a' then
        dbms_output.put_line('Excellent');
    when grade='b' then
        dbms_output.put_line('very good');
    when grade='c' then
        dbms_output.put_line('good');
    when grade='d' then
        dbms_output.put_line('fair');
    when grade='f' then
        dbms_output.put_line('poor');
    else
        dbms_output.put_line('No such grade');
end case;
end;
/
```

SQL> @6b

Enter value for grade: c
old 4: grade:='&grade';
new 4: grade:='c';
good

PL/SQL procedure successfully completed.

SQL> @6b

Enter value for grade: g
old 4: grade:='&grade';

Dept of CSE

new 4: grade:='g';
No such grade

PL/SQL procedure successfully completed.

C. NULLIF: Takes two arguments. If the two arguments are equal, then NULL is returned. otherwise the first argument is returned.

Syntax: `select column_name, NULLIF(argument1,arguement2) from table_name;`

Example:

SQL> select ename, nullif('ali','ali1') from emp;

ENAME	NUL
-----	----
ali	ali
ravi	ali
raju	ali
rakesh	ali

SQL> select ename, nullif('ali','ali') from emp;

ENAME	NUL
-----	--
ali	
ravi	
raju	
rakesh	

D. COALESCE: COALESCE () function accepts a list of arguments and returns the first one that evaluates to a non-null value.

Syntax: `coalesce("expression1","expression2",...);`

Example:

SQL> select coalesce(NULL,'CRRCOE','IT') from dual;

COALE

CRRCOE

EXPERIMENT: 7

Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISEAPPLICATION ERROR.

37

A. WHILE LOOP: A **WHILE LOOP** statement in PL/SQL programming language repeatedly executes a target statement as long as a given condition is true.

Syntax:

WHILE condition LOOP

 sequence_of_statements

END LOOP;

PL/SQL Code: A PL/SQL Program to find sum of ODD number upto given number using While loop

SQL> ed 7a

```
set serveroutput on;
declare
    inval number;
    endval number;
    s number default 0;
begin
    inval:=1;
    endval:=&endval;
    while inval<endval loop
        s:=s+inval;
        inval:=inval+2;
    end loop;
    dbms_output.put_line('sum of odd numbers between 1 and '||endval||' is '|| s);
end;
/
```

SQL> @7a

Enter value for endval: 100

old 7: endval:=&endval;

new 7: endval:=100;

sum of odd numbers between 1 and 100 is 2500

PL/SQL procedure successfully completed.

B. FOR Loop: A **FOR LOOP** is a repetition control structure that allows us to efficiently write a loop

that needs to execute a specific number of times.

38

Syntax

```
FOR counter IN initial_value .. final_value LOOP
    sequence_of_statements;
END LOOP;
```

PL/SQL CODE: A PL/SQL code to print multiplication table using for loop

SQL> ed 7b

```
set serveroutput on;
DECLARE
    VAR1 NUMBER;
    VAR2 NUMBER;
BEGIN
    dbms_output.put_line('Enter number to print multiplication table');
    VAR1:=&VAR1;
    FOR VAR2 IN 1..10 LOOP
        DBMS_OUTPUT.PUT_LINE(VAR1||'X'||VAR2||'='||VAR1*VAR2);
    END LOOP;
END;
/
```

SQL> @7b

Enter value for var1: 2

old 6: VAR1:=&VAR1;

new 6: VAR1:=2;

Enter number to print multiplication table

2X1=2

2X2=4

2X3=6

2X4=8

2X5=10

2X6=12

2X7=14

2X8=16

2X9=18

2X10=20

PL/SQL procedure successfully completed.

C. NESTED LOOP: PL/SQL allows using one loop inside another loop. It may be either basic, while or for loop.

Syntax:

```
WHILE condition1 LOOP
    sequence_of_statements1
    WHILE condition2 LOOP
        sequence_of_statements2
    END LOOP;
END LOOP;
```

PL/SQL CODE: A PL/SQL program to print n prime number using nested loop.

SQL> ed 7c

```
DECLARE
    i number(3);
    j number(3);
BEGIN
    i := 2;
    LOOP
        j := 2;
        LOOP
            exit WHEN ((mod(i, j) = 0) or (j = i));
            j := j + 1;
        END LOOP;
        IF (j = i) THEN
            dbms_output.put_line(i || ' is prime');
        END IF;
        i := i + 1;
        exit WHEN i = 50;
    END LOOP;
END;
```

SQL> @7c

2 is prime
3 is prime
5 is prime
7 is prime
11 is prime
13 is prime
17 is prime
19 is prime
23 is prime
29 is prime
31 is prime
37 is prime
41 is prime
43 is prime
47 is prime

40

PL/SQL procedure successfully completed.

EXPERIMENT: 8

Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

SQL> create table enquiry (enqno1 number(3), fname varchar2(30));

Table created.

SQL> insert into enquiry values (111,'sai');

1 row created.

SQL> insert into enquiry values (112,'sindhu');

1 row created.

PL/SQL CODE to create procedure

SQL> ed findname

```
create procedure findname(enquiryno1 IN number,fname1 OUT varchar2) is
fname2 varchar2(30);
begin
select fname into fname2 from enquiry where enqno1=enquiryno1;
fname1:=fname2;
exception when no_data_found then
raise_application_error(-20100,'The given number is not present');
end;
/
```

SQL> @findname

Procedure created.

PL/SQL Code for calling procedure in program

SQL> ed pro8

```
set serveroutput on;
declare
enqno2 number(5);
fname2 varchar2(30);
begin
enqno2:=&enqno2;
findname(enqno2,fname2);
dbms_output.put_line('Person name of equiry id '||enqno2||' is '||fname2);
end;
/
```

SQL> @pro8

Enter value for enqno2: 114

old 5: enqno2:=&enqno2;

new 5: enqno2:=114;

declare

*

ERROR at line 1:

ORA-20100: The given number is not present

ORA-06512: at "SYSTEM.FINDNAME", line 7

ORA-06512: at line 6

SQL> @pro8

Enter value for enqno2: 112

old 5: enqno2:=&enqno2;

new 5: enqno2:=112;

Person name of equiry id 112 is sindhu

PL/SQL procedure successfully completed.

EXPERIMENT: 9

Program development using creation of stored functions, invoke functions in SQL statements and write complex functions.

Sol:

SQL> create table dept(deptno int,dname varchar(10));

Table created.

SQL> insert into dept values(1219,'sai');

1 row created.

PL/SQL CODE to create user define function

```
create or replace function getname(dno number)
return varchar2 as
fname1 varchar2(30);
begin
select dname into fname1 from dept where deptno=dno;
return(fname1);
exception
when no_data_found then
raise_application_error(-20100,'Your entered Department number is not exists');
end;
/
```

SQL> @getname

Function created.

PL/SQL Code for calling function in program

Dept of CSE

SQL> ed pro9

```
set serveroutput on;
declare
fname2 varchar2(30);
deptno2 number(5);
begin
deptno2:=&deptno;
fname2:=getname(deptno2);
dbms_output.put_line(fname2||' is in dept no '||deptno2);
end;
/
```

SQL> @pro9

Enter value for deptno: 1219

old 5: deptno2:=&deptno;

new 5: deptno2:=1219;

sai is in dept no 1219

PL/SQL procedure successfully completed.

SQL> @pro9

Enter value for deptno: 1001

old 5: deptno2:=&deptno;

new 5: deptno2:=1001;

declare

*

ERROR at line 1:

ORA-20100: Your entered Department number is not exists

ORA-06512: at "SYSTEM.GETNAME", line 9

ORA-06512: at line 6

EXPERIMENT: 10

Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

Sol:

SQL> create table customers(id number(3), name varchar2(10), age number(3), address varchar2(10), salary number(10,2));

Table created.

SQL> insert into customers values(1,'ramesh',32,'ahmedabad',2000);

1 row created.

SQL> insert into customers values(2,'khilan',25,'Delhi',1500);

1 row created.

SQL> insert into customers values(3,'kaushik',23,'Kota',2000);

1 row created.

SQL> insert into customers values(4,'chitali',25,'Mumbai',6500);

1 row created.

SQL> select *from customers;

ID	NAME	AGE	ADDRESS	SALARY
1	ramesh	32	ahmedabad	2000
2	khilan	25	Delhi	1500
3	kaushik	23	Kota	2000
4	chitali	25	Mumbai	6500

4 rows selected.

SQL> ed pro10

DECLARE

c_id customers.id%type;

c_name customers.name%type;

Sol:

```
SQL> create table customers(id number(3), name varchar2(10), age number(3), address
      varchar2(10), salary number(10,2));
```

Table created.

```
SQL> insert into customers values(1,'ramesh',32,'ahmedabad',2000);
```

1 row created.

```
SQL> insert into customers values(2,'khilan',25,'Delhi',1500);
```

1 row created.

```
SQL> insert into customers values(3,'kaushik',23,'Kota',2000);
```

1 row created.

```
SQL> insert into customers values(4,'chitali',25,'Mumbai',6500);
```

1 row created.

```
SQL> select *from customers;
```

ID	NAME	AGE	ADDRESS	SALARY
1	ramesh	32	ahmedabad	2000
2	khilan	25	Delhi	1500
3	kaushik	23	Kota	2000
4	chitali	25	Mumbai	6500

4 rows selected.

PL/SQL Code for creation of trigger while insert / update records into a table.

```
SQL>ed pro11
```

```
CREATE OR REPLACE TRIGGER display_salary_changes
BEFORE DELETE OR INSERT OR UPDATE ON customers
FOR EACH ROW
WHEN (NEW.ID > 0)
DECLARE
    sal_diff number;
BEGIN
    sal_diff := :NEW.salary - :OLD.salary;
    dbms_output.put_line('Old salary: ' || :OLD.salary);
    dbms_output.put_line('New salary: ' || :NEW.salary);
    dbms_output.put_line('Salary difference: ' || sal_diff);
END;
/
```

SQL> @pro11

Trigger created.

SQL> insert into customers values(5,'Hardik',27,'Mumbai',5500);

Old salary:

New salary: 5500

Salary difference:

1 row created.

SQL> update customers set salary=salary+500 where id=2;

Old salary: 1500

New salary: 2000

Salary difference: 500

1 row updated.

EXPERIMENT: 12

Create a table and perform the search operation on table using indexing and non-indexing techniques.

Sol:

SQL> CREATE TABLE TEACHER(STAFF_ID VARCHAR2(4) PRIMARY KEY, STAFF_NAME VARCHAR2(30), QUALIFICATION VARCHAR2(10), HIREDATE DATE, JOB VARCHAR2(30), ADDRESS VARCHAR2(15), PH_NUM NUMBER(10), SALARY NUMBER(7, 2), DEPARTMENT VARCHAR2(10));

Table created.

SQL> insert into teacher values('T101','SUNITHA','MCA','29-JUN-06','ASSOCIATE PROFESSOR','VIJAYAWADA',9985061308,23000,'MCA');

1 row created.

SQL>insert into teacher values('T102','FRED SMITH','MTECH','07-MAR-03','ASSOCIATE PROFESSOR','GUNTUR',9985063445,36000,'MBA');

1 row created.

SQL>insert into teacher values('T103','JACK BARNES','BTECH','27-JUN-07','PROFESSOR','TENALI',9985012345,27000,'MTECH');

1 row created.

SQL>insert into teacher values('T104','JANE DOE','MCA','04-JUL-06','ASSISTANT PROFESSOR','VIJAYAWADA',9985045678,29000,'BTECH');

1 row created.

SQL>insert into teacher values('T105','JOE SHMOE','MBA','16-AUG-08','ASSOCIATE PROFESSOR','ELURU',9987651308,36000,'MCA');

1 row created.

SQL>insert into teacher values('T106','JON BAKER','MSC(COM)','12-JAN-03','PROFESSOR','HYDERABAD',8876561308,46000,'MCA');

1 row created.

```
SQL>insert into teacher values('T107','JOHN DOE','MSC(PHY)','06-FEB-04','ASSISTANT  
PROFESSOR','VIJAYAWADA',8345661308,31000,'MBA');
```

1 row created.

```
SQL>insert into teacher values('T108','KIM SMITH','MCA','10-MAR-08','ASSISTANT  
PROFESSOR','VIZAG',8374561308,26000,'MTECH');
```

1 row created.

```
SQL>insert into teacher values('T109','MARY PARKER','MTECH','02-APR-  
09','PROFESSOR','NELLORE',7893427649,52000,'MBA');
```

1 row created.

```
SQL>insert into teacher values('T110','SAMUEL JOHN','BTECH','19-MAY-05','ASSISTANT  
PROFESSOR','ELURU',9982222208,26000,'MBA');
```

1 row created.

```
SQL>insert into teacher values('T111','FRANKLIN WONG','MBA','20-AUG-06','ASSOCIATE  
PROFESSOR','VIZAG',9985033333,20000,'MTECH');
```

1 row created.

```
SQL>insert into teacher values('T112','SLICIA ZELAYA','MCA','16-SEP-04','ASSISTANT  
PROFESSOR','VIJAYAWADA',9985202020,33000,'BTECH');
```

1 row created.

```
SQL>insert into teacher values('T113','JENNIFER WALLACE','MSC(MATHS)','25-OCT-  
03','PROFESSOR','HYDERABAD',9902192033,54000,'MCA');
```

1 row created.

```
SQL>insert into teacher values('T114','RAMESH NARAYANA','MCA','24-NOV-  
04','ASSOCIATE PROFESSOR','NARASARAOPET',9988776655,34000,'MBA');
```

1 row created.

SQL>insert into teacher values('T115','JOYCE ENGLISH','MBA','22-DEC-06','ASSISTANT PROFESSOR','VIJAYAWADA',9998765443,45000,'MBA');

51

1 row created.

To show the query execution timing use the following query

SQL> Set timing on;

Retrieve details of teacher before creation of index.

SQL> select *from teacher;

STAF	STAFF_NAME	QUALIFICAT	HIREDATE	JOB	ADDRESS	PH_NUM	SALARY	DEPARTMENT
T101	SUNITHA	MCA	29-06-06	ASSOCIATE PROFESSOR	VIJAYAWADA	9985061308	23000	MCA
T102	FRED SMITH	MTECH	07-MAR-03	ASSOCIATE PROFESSOR	GUNTUR	9985063445	36000	MBA
T103	JACK BARNES	BTECH	27-JUN-07	PROFESSOR	TENALI	9985012345	27000	MTECH
T104	JANE DOE	MCA	04-JUL-06	ASSISTANT PROFESSOR	VIJAYAWADA	9985045678	29000	BTECH
T105	JOE SHMOE	MBA	16-AUG-08	ASSOCIATE PROFESSOR	ELURU	9987651308	36000	MCA
T106	JON BAKER	MSC(COM)	12-JAN-03	PROFESSOR	HYDERABAD	8876561308	46000	MCA
T107	JOHN DOE	MSC(PHY)	06-FEB-04	ASSISTANT PROFESSOR	VIJAYAWADA	8345661308	31000	MBA
T108	KIM SMITH	MCA	10-MAR-08	ASSISTANT PROFESSOR	VIZAG	8374561308	26000	MTECH
T109	MARY PARKER	MTECH	02-APR-09	PROFESSOR	NELLORE	7893427649	52000	MBA
T110	SAMUEL JOHN	BTECH	19-MAY-05	ASSISTANT PROFESSOR	ELURU	9982222208	26000	MBA
T111	FRANKLIN WONG	MBA	20-AUG-06	ASSOCIATE PROFESSOR	VIZAG	9985033333	20000	MTECH
T112	SLICIA ZELAYA	MCA	16-SEP-04	ASSISTANT PROFESSOR	VIJAYAWADA	9985202020	33000	BTECH
T113	JENNIFER WALLACE	MSC(MATHS)	25-OCT-03	PROFESSOR	HYDERABAD	9902192033	54000	MCA
T114	RAMESH NARAYANA	MCA	24-NOV-04	ASSOCIATE PROFESSOR	NARASARAOPET	9988776655	34000	MBA
T115	JOYCE ENGLISH	MBA	22-DEC-06	ASSISTANT PROFESSOR	VIJAYAWADA	9998765443	45000	MBA

15 rows selected.

Elapsed: 00:00:00.24

Index creation:

SQL> create index teacher_job_ind on teacher(job);

Index created.

52

Elapsed: 00:00:00.00

Retrieve details of teacher after creation of index.

SQL> select *from teacher;

STAF STAFF_NAME QUALIFICAT HIREDATE JOB ADDRESS PH_NUM SALARY DEPARTMENT

```
-----
T101 SUNITHA MCA 29-06-06 ASSOCIATE PROFESSOR VIJAYAWADA 9985061308 23000 MCA
T102 FRED SMITH MTECH 07-MAR-03 ASSOCIATE PROFESSOR GUNTUR 9985063445 36000 MBA
T103 JACK BARNES BTECH 27-JUN-07 PROFESSOR TENALI 9985012345 27000 MTECH
T104 JANE DOE MCA 04-JUL-06 ASSISTANT PROFESSOR VIJAYAWADA 9985045678 29000 BTECH
T105 JOE SHMOE MBA 16-AUG-08 ASSOCIATE PROFESSOR ELURU 9987651308 36000 MCA
T106 JON BAKER MSC(COM) 12-JAN-03 PROFESSOR HYDERABAD 8876561308 46000 MCA
T107 JOHN DOE MSC(PHY) 06-FEB-04 ASSISTANT PROFESSOR VIJAYAWADA 8345661308 31000 MBA
T108 KIM SMITH MCA 10-MAR-08 ASSISTANT PROFESSOR VIZAG 8374561308 26000 MTECH
T109 MARY PARKER MTECH 02-APR-09 PROFESSOR NELLORE 7893427649 52000 MBA
T110 SAMUEL JOHN BTECH 19-MAY-05 ASSISTANT PROFESSOR ELURU 9982222208 26000 MBA
T111 FRANKLIN WONG MBA 20-AUG-06 ASSOCIATE PROFESSOR VIZAG 9985033333 20000 MTECH
T112 SLICIA ZELAYA MCA 16-SEP-04 ASSISTANT PROFESSOR VIJAYAWADA 9985202020 33000 BTECH
T113 JENNIFER WALLACE MSC(MATHS) 25-OCT-03 PROFESSOR HYDERABAD 9902192033 54000 MCA
T114 RAMESH NARAYANA MCA 24-NOV-04 ASSOCIATE PROFESSOR NARASARAOPET 9988776655 34000 MBA
T115 JOYCE ENGLISH MBA 22-DEC-06 ASSISTANT PROFESSOR VIJAYAWADA 9998765443 45000 MBA
```

15 rows selected.

Elapsed: 00:00:00.13

