

Spool Generated For Class of Oracle By Satish K Yellanki

SQL> cl scr

SQL> SET VERIFY OFF

SQL> cl scr

SQL> DESC Emp

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	NOT NULL	NUMBER(2)

SQL> CREATE INDEX EmpEmpnoIDX

2 ON Emp(Empno);

ON Emp(Empno)

*

ERROR at line 2:

ORA-01408: such column list already indexed

SQL> COLUMN Empno FORMAT 9999

SQL> COLUMN Deptno FORMAT 99

SQL> COLUMN MGR FORMAT 9999

SQL> COLUMN Sal FORMAT 9999

SQL> COLUMN Comm FORMAT 9999

SQL> cl scr

SQL> SELECT * FROM Emp;

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT		17-NOV-81	5000		10
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7788	SCOTT	ANALYST	7566	09-DEC-82	3000		20
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

14 rows selected.

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```
SQL> SELECT * FROM Emp
  2  WHERE Empno = 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

```
SQL> cl scr
```

```
SQL> SET AUTOTRACE ON EXPLAIN
```

```
SQL> SELECT *
  2  FROM Emp
  3  WHERE Empno = 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=87)
 1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=87)
 2      1      INDEX (UNIQUE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE)) (Cost=1 Card=1)
```

```
SQL> SELECT *
  2  FROM Emp
  3  WHERE Ename = 'JONES';
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=1 Bytes=87)
 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=1 Bytes=87)
```

```
SQL> CREATE INDEX EmpEnameIDX
  2  ON Emp(Ename);
```

```
Index created.
```

```
SQL> SELECT *
  2  FROM Emp
```

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```
3 WHERE Ename = 'JONES';
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=87)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=87)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPENAMEIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT *  
2 FROM Emp  
3 WHERE Empno = 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=87)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=87)  
  
2      1      INDEX (UNIQUE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE)) (Cost=1 Card=1)
```

```
SQL> cl scr
```

```
SQL> SELECT *  
2 FROM Emp  
3 WHERE Empno = 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=87)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=87)
```

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```
2      1      INDEX (UNIQUE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE)
      ) (Cost=1 Card=1)
```

```
SQL> SELECT *
      2 FROM Emp
      3 WHERE Empno > 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT		17-NOV-81	5000		10
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7788	SCOTT	ANALYST	7566	09-DEC-82	3000		20
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

10 rows selected.

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=10 Bytes=870)

1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=10 Bytes=870)
```

```
SQL> SELECT *
      2 FROM Emp
      3 WHERE Empno < 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7369	SMITH	CLERK	7902	17-DEC-80	800		20

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=3 Bytes=261)

1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=3 Bytes=261)
```

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```
SQL> SELECT *
  2
SQL> SELECT *
  2 FROM Emp
  3 WHERE Empno <> 7566;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT		17-NOV-81	5000		10
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7788	SCOTT	ANALYST	7566	09-DEC-82	3000		20

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

13 rows selected.

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=13 Bytes=11
      31)

 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=13 Bytes
      =1131)
```

```
SQL> SELECT *
  2 FROM Emp
  3 WHERE Empno = 7566 OR Empno = 7839 OR Empno = 7782;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7839	KING	PRESIDENT		17-NOV-81	5000		10

Execution Plan

```
-----
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```

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```
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=3 Bytes=261
      )
1      0      INLIST ITERATOR
2      1      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 C
      ard=3 Bytes=261)
3      2      INDEX (RANGE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE
      )) (Cost=2 Card=1)
```

```
SQL> SELECT *
      2 FROM Emp
      3 WHERE Empno IN(7566, 7839, 7782);
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7839	KING	PRESIDENT		17-NOV-81	5000		10

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=3 Bytes=261
      )
1      0      INLIST ITERATOR
2      1      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 C
      ard=3 Bytes=261)
3      2      INDEX (RANGE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE
      )) (Cost=2 Card=1)
```

```
SQL> SELECT *
      2 FROM Emp
      3 WHERE Empno = 7566 AND Empno = 7654;
```

no rows selected

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=87)
1      0      FILTER
2      1      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 C
      ard=1 Bytes=87)
3      2      INDEX (UNIQUE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQU
      E)) (Cost=1 Card=1)
```

Spool Generated For Class of Oracle By Satish K Yellanki

```
SQL> SELECT *
  2 FROM Emp
  3 WHERE Empno = 7566 AND Ename = 'JONES';
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=87)
 1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=87)

 2      1      INDEX (RANGE SCAN) OF 'EMPENAMEIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT *
  2 FROM Emp
  3 WHERE Empno = 7566 OR Ename = 'JONES';
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=1 Bytes=87)
 1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=3 Card=1 Bytes=87)

 2      1      BITMAP CONVERSION (TO ROWIDS)
 3      2      BITMAP OR
 4      3      BITMAP CONVERSION (FROM ROWIDS)
 5      4      INDEX (RANGE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE)) (Cost=1)

 6      3      BITMAP CONVERSION (FROM ROWIDS)
 7      6      INDEX (RANGE SCAN) OF 'EMPENAMEIDX' (INDEX) (Cost=1)
```

```
SQL> SPPOOL OFF
SQL> cl scr
```

```
SQL> CREATE INDEX EmpEnameJobIDX
```

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```
2 AS
3
SQL> CREATE INDEX EmpEnameJobIDX
2 ON Emp(Ename, Job);
```

Index created.

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
BLAKE	2850	30	MANAGER	01-MAY-81
CLARK	2450	10	MANAGER	09-JUN-81
JONES	2975	20	MANAGER	02-APR-81

```
SQL> SET AUTOTRACE ON EXPLAIN
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=48)
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=48)
2      1      INDEX (RANGE SCAN) OF 'EMPENAMEJOBIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

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Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=48)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=48)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPNAMEJOBIDX' (INDEX) (Cost=1 Card=1)
```

SQL> ED

Wrote file afiedt.buf

```
1  SELECT Empno, Ename, Sal, Deptno, Job, HireDate  
2  FROM Emp  
3* WHERE Empno = 7566  
SQL> /
```

EMPNO	ENAME	SAL	DEPTNO	JOB	HIREDATE
7566	JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=61)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=61)  
  
2      1      INDEX (UNIQUE SCAN) OF 'EMP_PRIMARY_KEY' (INDEX (UNIQUE)) (Cost=1 Card=1)
```

SQL> ED

Wrote file afiedt.buf

```
1  SELECT Empno, Ename, Sal, Deptno, Job, HireDate  
2  FROM Emp  
3* WHERE Empno = 7566 AND Ename = 'JONES'  
SQL> /
```

EMPNO	ENAME	SAL	DEPTNO	JOB	HIREDATE
7566	JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=1 Card=1 Bytes=61)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=1 Card=1 Bytes=61)
```

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```
2      1      INDEX (RANGE SCAN) OF 'EMPENAMEJOBIDX' (INDEX) (Cost=1 C
      card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES' AND Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=48)
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Car
      d=1 Bytes=48)

2      1      INDEX (RANGE SCAN) OF 'EMPENAMEJOBIDX' (INDEX) (Cost=1 C
      ard=1)
```

```
SQL> CREATE INDEX EmpEnameIDX
2 ON Emp(Ename);
```

Index created.

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES' AND Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=48)
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Car
      d=1 Bytes=48)

2      1      INDEX (RANGE SCAN) OF 'EMPENAMEJOBIDX' (INDEX) (Cost=1 C
      ard=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate
2 FROM Emp
3 WHERE Ename = 'JONES';
```

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ENAME	SAL	DEPTNO	JOB	HIREDATE
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=48)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=48)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPENAMEIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate  
2 FROM Emp  
3 WHERE Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
BLAKE	2850	30	MANAGER	01-MAY-81
CLARK	2450	10	MANAGER	09-JUN-81
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=3 Bytes=144)  
      )  
  
1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=3 Bytes=144)
```

```
SQL> CREATE INDEX EmpJobEnameIDX  
2 ON Emp(Job, Ename);
```

Index created.

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate  
2 FROM Emp  
3 WHERE Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
BLAKE	2850	30	MANAGER	01-MAY-81
CLARK	2450	10	MANAGER	09-JUN-81
JONES	2975	20	MANAGER	02-APR-81

Spool Generated For Class of Oracle By Satish K Yellanki

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=3 Bytes=144  
      )  
  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Car  
      d=3 Bytes=144)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPJOBENAMEIDX' (INDEX) (Cost=1 C  
      ard=3)
```

```
SQL> CREATE INDEX EmpJobIDX  
      2 ON Emp(Job);
```

Index created.

```
SQL> SELECT Ename, Sal, Deptno, Job, HireDate  
      2 FROM Emp  
      3 WHERE Job = 'MANAGER';
```

ENAME	SAL	DEPTNO	JOB	HIREDATE
BLAKE	2850	30	MANAGER	01-MAY-81
CLARK	2450	10	MANAGER	09-JUN-81
JONES	2975	20	MANAGER	02-APR-81

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=3 Bytes=144  
      )  
  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Car  
      d=3 Bytes=144)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPJOBENAMEIDX' (INDEX) (Cost=1 C  
      ard=3)
```

```
SQL> cl scr
```

```
SQL> CREATE UNIQUE INDEX EmpEnameUNQIDX  
      2 ON Emp(Ename);  
ON Emp(Ename)  
      *  
ERROR at line 2:  
ORA-01408: such column list already indexed
```

```
SQL> DROP INDEX EmpEnameIDX;
```

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Index dropped.

```
SQL> CREATE UNIQUE INDEX EmpEnameUNQIDX
  2  ON Emp(Ename);
```

Index created.

```
SQL> INSERT INTO Emp(Empno, Ename, Deptno, Job)
  2  VALUES(1234, 'ADAMS', 30, 'CLERK');
INSERT INTO Emp(Empno, Ename, Deptno, Job)
*
ERROR at line 1:
ORA-00001: unique constraint (SCOTT.EMPENAMEUNQIDX) violated
```

```
SQL> DROP INDEX EmpEnameUNQIDX;
```

Index dropped.

```
SQL> cl scr
```

```
SQL> CREATE UNIQUE INDEX EmpDeptnoUNQIDX
  2  ON Emp(Deptno);
ON Emp(Deptno)
*
ERROR at line 2:
ORA-01452: cannot CREATE UNIQUE INDEX; duplicate keys found
```

```
SQL> cl scr
```

```
SQL> ROLLBACK;
```

Rollback complete.

```
SQL> cl scr
```

```
SQL> SELECT ROWID, Empno, Ename, Sal
  2  FROM Emp;
```

ROWID	EMPNO	ENAME	SAL
AAAMcCAAEAAAAHPAAA	7839	KING	5000
AAAMcCAAEAAAAHPAAB	7698	BLAKE	2850
AAAMcCAAEAAAAHPAAC	7782	CLARK	2450
AAAMcCAAEAAAAHPAAD	7566	JONES	2975
AAAMcCAAEAAAAHPAAE	7654	MARTIN	1250
AAAMcCAAEAAAAHPAAF	7499	ALLEN	1600
AAAMcCAAEAAAAHPAAG	7844	TURNER	1500
AAAMcCAAEAAAAHPAAH	7900	JAMES	950
AAAMcCAAEAAAAHPAAI	7521	WARD	1250
AAAMcCAAEAAAAHPAAJ	7902	FORD	3000
AAAMcCAAEAAAAHPAAK	7369	SMITH	800

ROWID	EMPNO	ENAME	SAL
-------	-------	-------	-----

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```
AAAMcCAAEAAAAHPAAL      7788 SCOTT      3000
AAAMcCAAEAAAAHPAAM      7876 ADAMS      1100
AAAMcCAAEAAAAHPAAN      7934 MILLER     1300
```

14 rows selected.

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=14 Bytes=56
        0)

 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=14 Bytes
        =560)
```

SQL> cl scr

```
SQL> SELECT ROWID, Empno, Ename, Deptno
       2 FROM Emp;
```

ROWID	EMPNO	ENAME	DEPTNO
AAAMcCAAEAAAAHPAAA	7839	KING	10
AAAMcCAAEAAAAHPAAB	7698	BLAKE	30
AAAMcCAAEAAAAHPAAC	7782	CLARK	10
AAAMcCAAEAAAAHPAAD	7566	JONES	20
AAAMcCAAEAAAAHPAAE	7654	MARTIN	30
AAAMcCAAEAAAAHPAAF	7499	ALLEN	30
AAAMcCAAEAAAAHPAAG	7844	TURNER	30
AAAMcCAAEAAAAHPAAH	7900	JAMES	30
AAAMcCAAEAAAAHPAAI	7521	WARD	30
AAAMcCAAEAAAAHPAAJ	7902	FORD	20
AAAMcCAAEAAAAHPAAK	7369	SMITH	20

ROWID	EMPNO	ENAME	DEPTNO
AAAMcCAAEAAAAHPAAL	7788	SCOTT	20
AAAMcCAAEAAAAHPAAM	7876	ADAMS	20
AAAMcCAAEAAAAHPAAN	7934	MILLER	10

14 rows selected.

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=14 Bytes=56
        0)

 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=14 Bytes
        =560)
```

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SQL> cl scr

```
SQL> SELECT Ename, Deptno, Sal, Comm, Sal + NVL(Comm) TotSal
 2  FROM Emp
 3  WHERE Sal + NVL(Comm) > 2000;
```

```
SELECT Ename, Deptno, Sal, Comm, Sal + NVL(Comm) TotSal
*
```

ERROR at line 1:

ORA-00909: invalid number of arguments

SQL> ED

Wrote file afiedt.buf

```
 1  SELECT Ename, Deptno, Sal, Comm, Sal + NVL(Comm, 0) TotSal
 2  FROM Emp
 3* WHERE Sal + NVL(Comm, 0) > 2000
```

SQL> /

ENAME	DEPTNO	SAL	COMM	TOTSAL
KING	10	5000		5000
BLAKE	30	2850		2850
CLARK	10	2450		2450
JONES	20	2975		2975
MARTIN	30	1250	1400	2650
FORD	20	3000		3000
SCOTT	20	3000		3000

7 rows selected.

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=7 Bytes=322
    )

 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=7 Bytes=
    322)
```

```
SQL> CREATE INDEX EmpTotSalIDX
 2  ON Emp(Sal + NVL(Comm, 0));
```

Index created.

```
SQL> SELECT Ename, Deptno, Sal, Comm, Sal + NVL(Comm, 0) TotSal
 2  FROM Emp
 3  WHERE Sal + NVL(Comm, 0) > 2000;
```

ENAME	DEPTNO	SAL	COMM	TOTSAL
CLARK	10	2450		2450

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MARTIN	30	1250	1400	2650
BLAKE	30	2850		2850
JONES	20	2975		2975
FORD	20	3000		3000
SCOTT	20	3000		3000
KING	10	5000		5000

7 rows selected.

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=7 Bytes=322
      )
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Car
      d=7 Bytes=322)
2      1      INDEX (RANGE SCAN) OF 'EMPTOTSALIDX' (INDEX) (Cost=1 Car
      d=1)
```

```
SQL> SELECT Ename, Sal, Sal * 12 AnnSal
2  FROM Emp
3  WHERE Sal * 12 > 35000;
```

ENAME	SAL	ANNSAL
KING	5000	60000
JONES	2975	35700
FORD	3000	36000
SCOTT	3000	36000

Execution Plan

```
-----
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=4 Bytes=80)
1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=4 Bytes=
      80)
```

```
SQL> CREATE INDEX EmpAnnSalIDX
2  ON Emp(Sal * 12);
```

Index created.

```
SQL> SELECT Ename, Sal, Sal * 12 AnnSal
2  FROM Emp
3  WHERE Sal * 12 > 35000;
```

ENAME	SAL	ANNSAL
-------	-----	--------

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JONES	2975	35700
FORD	3000	36000
SCOTT	3000	36000
KING	5000	60000

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=4 Bytes=80)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=4 Bytes=80)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPANNSALIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job  
2 FROM Emp  
3 WHERE LOWER(Ename) = 'smith';
```

ENAME	SAL	DEPTNO	JOB
SMITH	800	20	CLERK

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=1 Bytes=39)  
1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=1 Bytes=39)
```

```
SQL> CREATE INDEX EmpEnameLIDX  
2 ON Emp(LOWER(Ename));
```

Index created.

```
SQL> CREATE INDEX EmpEnameUIDX  
2 ON Emp(UPPER(Ename));
```

Index created.

```
SQL> CREATE INDEX EmpEnameIIDX  
2 ON Emp(INITCAP(Ename));
```

Index created.

```
SQL> SELECT Ename, Sal, Deptno, Job  
2 FROM Emp  
3 WHERE LOWER(Ename) = 'smith';
```

ENAME	SAL	DEPTNO	JOB
-------	-----	--------	-----

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```
-----  
SMITH                800                20 CLERK
```

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=39)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=39)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPENAMELIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job  
2 FROM Emp  
3 WHERE INITCAP(Ename) = 'Smith';
```

```
ENAME                SAL                DEPTNO JOB  
-----  
SMITH                800                20 CLERK
```

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=39)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=39)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPNAMEIIDX' (INDEX) (Cost=1 Card=1)
```

```
SQL> SELECT Ename, Sal, Deptno, Job  
2 FROM Emp  
3 WHERE Ename = UPPER('smith');
```

```
ENAME                SAL                DEPTNO JOB  
-----  
SMITH                800                20 CLERK
```

Execution Plan

```
-----  
0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=2 Card=1 Bytes=39)  
1      0      TABLE ACCESS (BY INDEX ROWID) OF 'EMP' (TABLE) (Cost=2 Card=1 Bytes=39)  
  
2      1      INDEX (RANGE SCAN) OF 'EMPENAMEJOBIDX' (INDEX) (Cost=1 Card=1)
```

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```
SQL> SELECT Ename, HireDate, TRUNC(MONTHS_BETWEEN(SYSDATE, HireDate) / 12)
EmpExp
  2 FROM Emp
  3 WHERE TRUNC(MONTHS_BETWEEN(SYSDATE, HireDate) / 12) > 28;
```

ENAME	HIREDATE	EMPEXP
BLAKE	01-MAY-81	29
CLARK	09-JUN-81	29
JONES	02-APR-81	29
ALLEN	20-FEB-81	29
WARD	22-FEB-81	29
SMITH	17-DEC-80	29

6 rows selected.

Execution Plan

```
-----
 0      SELECT STATEMENT Optimizer=ALL_ROWS (Cost=3 Card=6 Bytes=96)
 1      0      TABLE ACCESS (FULL) OF 'EMP' (TABLE) (Cost=3 Card=6 Bytes=
          96)
```

```
SQL> CREATE INDEX EmpEmpExpIDX
  2 ON Emp(TRUNC(MONTHS_BETWEEN(SYSDATE, HireDate) / 12));
ON Emp(TRUNC(MONTHS_BETWEEN(SYSDATE, HireDate) / 12))
      *
```

ERROR at line 2:
ORA-01743: only pure functions can be indexed

```
SQL> cl scr
```

```
SQL> DESC USER_INDEXES
```

Name	Null?	Type
INDEX_NAME	NOT NULL	VARCHAR2(30)
INDEX_TYPE		VARCHAR2(27)
TABLE_OWNER	NOT NULL	VARCHAR2(30)
TABLE_NAME	NOT NULL	VARCHAR2(30)
TABLE_TYPE		VARCHAR2(11)
UNIQUENESS		VARCHAR2(9)
COMPRESSION		VARCHAR2(8)
PREFIX_LENGTH		NUMBER
TABLESPACE_NAME		VARCHAR2(30)
INI_TRANS		NUMBER
MAX_TRANS		NUMBER
INITIAL_EXTENT		NUMBER
NEXT_EXTENT		NUMBER
MIN_EXTENTS		NUMBER
MAX_EXTENTS		NUMBER

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PCT_INCREASE	NUMBER
PCT_THRESHOLD	NUMBER
INCLUDE_COLUMN	NUMBER
FREELISTS	NUMBER
FREELIST_GROUPS	NUMBER
PCT_FREE	NUMBER
LOGGING	VARCHAR2(3)
BLEVEL	NUMBER
LEAF_BLOCKS	NUMBER
DISTINCT_KEYS	NUMBER
AVG_LEAF_BLOCKS_PER_KEY	NUMBER
AVG_DATA_BLOCKS_PER_KEY	NUMBER
CLUSTERING_FACTOR	NUMBER
STATUS	VARCHAR2(8)
NUM_ROWS	NUMBER
SAMPLE_SIZE	NUMBER
LAST_ANALYZED	DATE
DEGREE	VARCHAR2(40)
INSTANCES	VARCHAR2(40)
PARTITIONED	VARCHAR2(3)
TEMPORARY	VARCHAR2(1)
GENERATED	VARCHAR2(1)
SECONDARY	VARCHAR2(1)
BUFFER_POOL	VARCHAR2(7)
USER_STATS	VARCHAR2(3)
DURATION	VARCHAR2(15)
PCT_DIRECT_ACCESS	NUMBER
ITYP_OWNER	VARCHAR2(30)
ITYP_NAME	VARCHAR2(30)
PARAMETERS	VARCHAR2(1000)
GLOBAL_STATS	VARCHAR2(3)
DOMIDX_STATUS	VARCHAR2(12)
DOMIDX_OPSTATUS	VARCHAR2(6)
FUNCIDX_STATUS	VARCHAR2(8)
JOIN_INDEX	VARCHAR2(3)
IOT_REDUNDANT_PKEY_ELIM	VARCHAR2(3)
DROPPED	VARCHAR2(3)

SQL> DESC USER_IND_COLUMNS

Name	Null?	Type
INDEX_NAME		VARCHAR2(30)
TABLE_NAME		VARCHAR2(30)
COLUMN_NAME		VARCHAR2(4000)
COLUMN_POSITION		NUMBER
COLUMN_LENGTH		NUMBER
CHAR_LENGTH		NUMBER
DESCEND		VARCHAR2(4)

SQL> SPOOL OFF