A)

Procedure:

```
create or replace procedure ml_raise_sal(amount number)
is service_years number;
begin
for r in (select empno from ml_emp)
loop
select floor(months_between(sysdate, (select hiredate from ml_emp where empno = r.empno))/12) into service_years from dual;
if (service_years < 5) then
    update ml_emp set sal = sal + amount where empno = r.empno;
else
    if (service_years < 10) then
        update ml_emp set sal = sal + 1.1*amount where empno = r.empno;
    else
        if (service_years < 15) then
            update ml_emp set sal = sal + 1.15*amount where empno = r.empno;
        else
            update ml_emp set sal = sal + 1.2*amount where empno = r.empno;
        end if;
    end if;
end if;
end loop;
end ml_raise_sal;
```

Execute procedure:

```
execute ml_raise_sal(500);
select * from ml_emp;
execute ml_raise_sal(200);
select * from ml_emp;
execute ml_raise_sal(250);
select * from ml_emp;
execute ml_raise_sal(800);
select * from ml_emp;
```

Data before change:

EMPNO	EFNAME	ELNAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	CHARLES	SMITH	CLERK	7902	08-OCT-01	2400	-	20
7499	GRAYSON	ALLEN	SALESMAN	7698	12-DEC-01	4800	600	30
7521	MATTHEW	WARD	SALESMAN	7698	14-DEC-01	3750	1000	30
7566	NICHOLAS	JONES	MANAGER	7839	22-JAN-02	8925	-	20
7654	CHRIS	MARTIN	SALESMAN	7698	20-JUL-02	3750	2800	30
7698	BLAKE	GRIFFIN	MANAGER	7839	20-FEB-02	8550	-	30
7782	KENT	CLARK	MANAGER	7839	31-MAR-02	7350	-	10
7788	DEVIN	BOOKER	ANALYST	7566	08-FEB-08	9000	-	20
7839	MARTIN	KING	PRESIDENT	-	08-SEP-02	15000	-	10
7844	WILLIAM	TURNER	SALESMAN	7698	30-JUN-02	4500	0	30
7876	JOHN	ADAMS	CLERK	7788	13-MAR-08	3300	-	20
7900	LEBRON	JAMES	CLERK	7698	24-SEP-02	2850	-	30
7902	CHRISTIAN	FORD	ANALYST	7566	24-SEP-02	9000	-	20
7934	MIKE	MILLER	CLERK	7782	14-NOV-02	3900	-	10

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14 rows selected.

Data after first change:

EMPNO	EFNAME	ELNAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	CHARLES	SMITH	CLERK	7902	08-OCT-01	3000	-	20
7499	GRAYSON	ALLEN	SALESMAN	7698	12-DEC-01	5400	600	30
7521	MATTHEW	WARD	SALESMAN	7698	14-DEC-01	4350	1000	30
7566	NICHOLAS	JONES	MANAGER	7839	22-JAN-02	9525	-	20
7654	CHRIS	MARTIN	SALESMAN	7698	20-JUL-02	4350	2800	30
7698	BLAKE	GRIFFIN	MANAGER	7839	20-FEB-02	9150	-	30
7782	KENT	CLARK	MANAGER	7839	31-MAR-02	7950	-	10
7788	DEVIN	BOOKER	ANALYST	7566	08-FEB-08	9575	-	20
7839	MARTIN	KING	PRESIDENT	-	08-SEP-02	15600	-	10
7844	WILLIAM	TURNER	SALESMAN	7698	30-JUN-02	5100	0	30
7876	JOHN	ADAMS	CLERK	7788	13-MAR-08	3875	-	20
7900	LEBRON	JAMES	CLERK	7698	24-SEP-02	3450	-	30
7902	CHRISTIAN	FORD	ANALYST	7566	24-SEP-02	9600	-	20
7934	MIKE	MILLER	CLERK	7782	14-NOV-02	4500	-	10

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14 rows selected.

Data after second change

EMPNO	EFNAME	ELNAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	CHARLES	SMITH	CLERK	7902	08-OCT-01	3240	-	20
7499	GRAYSON	ALLEN	SALESMAN	7698	12-DEC-01	5640	600	30
7521	MATTHEW	WARD	SALESMAN	7698	14-DEC-01	4590	1000	30
7566	NICHOLAS	JONES	MANAGER	7839	22-JAN-02	9765	-	20
7654	CHRIS	MARTIN	SALESMAN	7698	20-JUL-02	4590	2800	30
7698	BLAKE	GRIFFIN	MANAGER	7839	20-FEB-02	9390	-	30
7782	KENT	CLARK	MANAGER	7839	31-MAR-02	8190	-	10
7788	DEVIN	BOOKER	ANALYST	7566	08-FEB-08	9805	-	20
7839	MARTIN	KING	PRESIDENT	-	08-SEP-02	15840	-	10
7844	WILLIAM	TURNER	SALESMAN	7698	30-JUN-02	5340	0	30
7876	JOHN	ADAMS	CLERK	7788	13-MAR-08	4105	-	20
7900	LEBRON	JAMES	CLERK	7698	24-SEP-02	3690	-	30
7902	CHRISTIAN	FORD	ANALYST	7566	24-SEP-02	9840	-	20
7934	MIKE	MILLER	CLERK	7782	14-NOV-02	4740	-	10

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Data after third change

EMPNO	EFNAME	ELNAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	CHARLES	SMITH	CLERK	7902	08-OCT-01	3540	-	20
7499	GRAYSON	ALLEN	SALESMAN	7698	12-DEC-01	5940	600	30
7521	MATTHEW	WARD	SALESMAN	7698	14-DEC-01	4890	1000	30
7566	NICHOLAS	JONES	MANAGER	7839	22-JAN-02	10065	-	20
7654	CHRIS	MARTIN	SALESMAN	7698	20-JUL-02	4890	2800	30
7698	BLAKE	GRIFFIN	MANAGER	7839	20-FEB-02	9690	-	30
7782	KENT	CLARK	MANAGER	7839	31-MAR-02	8490	-	10
7788	DEVIN	BOOKER	ANALYST	7566	08-FEB-08	10092.5	-	20
7839	MARTIN	KING	PRESIDENT	-	08-SEP-02	16140	-	10
7844	WILLIAM	TURNER	SALESMAN	7698	30-JUN-02	5640	0	30
7876	JOHN	ADAMS	CLERK	7788	13-MAR-08	4392.5	-	20
7900	LEBRON	JAMES	CLERK	7698	24-SEP-02	3990	-	30
7902	CHRISTIAN	FORD	ANALYST	7566	24-SEP-02	10140	-	20
7934	MIKE	MILLER	CLERK	7782	14-NOV-02	5040	-	10

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14 rows selected.

Data after fourth change

EMPNO	EFNAME	ELNAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	CHARLES	SMITH	CLERK	7902	08-OCT-01	4500	-	20
7499	GRAYSON	ALLEN	SALESMAN	7698	12-DEC-01	6900	600	30
7521	MATTHEW	WARD	SALESMAN	7698	14-DEC-01	5850	1000	30
7566	NICHOLAS	JONES	MANAGER	7839	22-JAN-02	11025	-	20
7654	CHRIS	MARTIN	SALESMAN	7698	20-JUL-02	5850	2800	30
7698	BLAKE	GRIFFIN	MANAGER	7839	20-FEB-02	10650	-	30
7782	KENT	CLARK	MANAGER	7839	31-MAR-02	9450	-	10
7788	DEVIN	BOOKER	ANALYST	7566	08-FEB-08	11012.5	-	20
7839	MARTIN	KING	PRESIDENT	-	08-SEP-02	17100	-	10
7844	WILLIAM	TURNER	SALESMAN	7698	30-JUN-02	6600	0	30
7876	JOHN	ADAMS	CLERK	7788	13-MAR-08	5312.5	-	20
7900	LEBRON	JAMES	CLERK	7698	24-SEP-02	4950	-	30
7902	CHRISTIAN	FORD	ANALYST	7566	24-SEP-02	11100	-	20
7934	MIKE	MILLER	CLERK	7782	14-NOV-02	6000	-	10

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14 rows selected.

B)

Function:

```
create or replace function ml_duration(in_date date)
return varchar2
is duration varchar2(30); years number; months number;days number;
begin
years := floor(months_between(sysdate, in_date)/12);
months := floor(months_between(sysdate, in_date) - 12*years);
days := floor((months_between(sysdate, in_date) - 12*years - months) * 31); --The docs say "the fractional portion of the result based on a 31-day month"
duration := to_char(years) || ' YEARS ' || to_char(months) || ' MONTHS ' || to_char(days) || ' DAYS';
return duration;
end;
```

Result:

EMPNO	HIREDATE	HIRE_DURATION
7369	08-OCT-01	20 YEARS 1 MONTHS 26 DAYS
7499	12-DEC-01	19 YEARS 11 MONTHS 22 DAYS
7521	14-DEC-01	19 YEARS 11 MONTHS 20 DAYS
7566	22-JAN-02	19 YEARS 10 MONTHS 12 DAYS
7654	20-JUL-02	19 YEARS 4 MONTHS 14 DAYS
7698	20-FEB-02	19 YEARS 9 MONTHS 14 DAYS
7782	31-MAR-02	19 YEARS 8 MONTHS 3 DAYS
7788	08-FEB-08	13 YEARS 9 MONTHS 26 DAYS
7839	08-SEP-02	19 YEARS 2 MONTHS 26 DAYS
7844	30-JUN-02	19 YEARS 5 MONTHS 4 DAYS
7876	13-MAR-08	13 YEARS 8 MONTHS 21 DAYS
7900	24-SEP-02	19 YEARS 2 MONTHS 10 DAYS
7902	24-SEP-02	19 YEARS 2 MONTHS 10 DAYS
7934	14-NOV-02	19 YEARS 0 MONTHS 20 DAYS

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14 rows selected.

C)
i)GENDER, MARITAL STATUS and RACE are suitable for creating bitmap indexes.
Bitmap for gender:
F: 1111111100000000
M: 0000000011111111
Bitmap for marital status:
S: 1110000011100000
M: 0001001000010010
D: 0000100000001000
W: 0000010100000101
Bitmap for race:
A: 1001010010010100
B: 0010100100101001
W: 0100001001000010

ii)
Female = 1111111100000000
Not Asian = 0110101101101011
Single or Married = 1111001011110010
(Female) and (not Asian) and (Single or Married) = 0110001000000000
List of patient_id:
10002
10003
10007

iii)

```
select * from ml_patient where gender = 'F' and (marital_status = 'S' or marital_status = 'M') and (race <> 'A');
```

PATIENT_ID	GENDER	MARITAL_STATUS	RACE
10002	F	S	W
10003	F	S	B
10007	F	M	W

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3 rows selected.

iv)

```
create bitmap index idx_gender on ml_patient(gender);
create bitmap index idx_marital_status on ml_patient(marital_status);
create bitmap index idx_race on ml_patient(race);
```

```
10 select * from user_indexes where index_type = 'BITMAP';
```

INDEX_NAME	INDEX_TYPE	TABLE_OWNER	TABLE_NAME	TABLE_TYPE	UNIQUENESS	COMPRESSION	PREFIX_LENGTH	TABLESPACE_NAME	INI_TRANS	MAX_TRANS	INITIAL_EXTENT	N
IDX_GENDER	BITMAP	SQL_DLJMQJPMVRFXKSJNDRQTGEDOI	ML_PATIENT	TABLE	NONUNIQUE	DISABLED	-	LIVESQL_USERS	2	255	65536	1
IDX_MARITAL_STATUS	BITMAP	SQL_DLJMQJPMVRFXKSJNDRQTGEDOI	ML_PATIENT	TABLE	NONUNIQUE	DISABLED	-	LIVESQL_USERS	2	255	65536	1
IDX_RACE	BITMAP	SQL_DLJMQJPMVRFXKSJNDRQTGEDOI	ML_PATIENT	TABLE	NONUNIQUE	DISABLED	-	LIVESQL_USERS	2	255	65536	1

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3 rows selected.