Assignment 3

course_code: COMP4003

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date_completed: Oct. 19th 2019

Part One

Q1

Person

```
create type phone_v as varray(3) of char(4);
/
```

```
create type location_t as object (
    city varchar2(10),
    country varchar2(10)
);
/
create type address_nt as table of location_t;
/
```

```
create table person (
    name varchar2(10) primary key,
    address address_nt,
    phones phone_v
)
nested table address store as address_tb;
```

Conference

```
create type paper_t as object(
    author varchar2(10),
    title varchar2(10),
    first_page integer,
    last_page integer
);
/

create type paper_nt as table of paper_t;
/
```

```
create type location_nt as table of location_t;
/
```

```
create type annual_conference_t as object (
    year integer,
    location location_nt,
    papers paper_nt
);
/
create type annual_conference_nt as table of annual_conference_t;
```

```
create table conference (
    name varchar2(10),
    annual_conferences annual_conference_nt
)
nested table annual_conferences store as ann_conf_tb (
    nested table location store as location_tb,
    nested table papers store as papers_tb
);
```

Journal

```
create type issue_t as object (
    num integer,
    papers paper_nt
);
/
create type issue_nt as table of issue_t;
/
```

```
create type volume_t as object (
    year integer,
    issues issue_nt
);
/
create type volume_nt as table of volume_t;
/
```

```
create table journal (
    name varchar2(10),
    volumes volume_nt
)
nested table volumes STORE as volume_tb (
    nested table issues STORE as issue_tb (
        nested table papers STORE as paper_tb
    )
);
```

Q2

Person

```
insert into person values (
    'Andy', address_nt(location_t('Paris', 'France')), phone_v(1000, 2000)
);

insert into person values (
    'Barb', address_nt(location_t('Ottawa', 'Canada')), phone_v(3000)
);

insert into person values (
    'Doug', address_nt(location_t('Chicago', 'USA')), phone_v(4000)
);

insert into person values (
    'John', address_nt(location_t('Atlanta', 'USA')), phone_v(5000)
);

insert into person values (
    'Mary', address_nt(location_t('Ottawa', 'Canada')), phone_v(3000, 6000)
);

insert into person values (
    'Tony', address_nt(location_t('Toronto', 'Canada')), phone_v(7000)
);
```

Conference

```
insert into conference values (
    'VLDB',
    annual_conference_nt(
        annual_conference_t(
            2019,
            location_nt(location_t('Paris', 'France')),
            paper_nt(
                paper_t('Andy','Databases',1,10),
                paper_t('Barb','Algebra',11,20),
                paper_t('Doug','Calculus',21,30)
            )
        ),
        annual_conference_t(
            2018,
            location_nt(location_t('Ottawa', 'Canada')),
            paper_nt(
                paper_t('John','ODMG',1,10),
                paper_t('Barb','SQL',11,20)
            )
        )
    )
);
```

Journal

```
insert into journal values (
    'TODS',
    volume_nt(
        volume_t(
            2019,
            issue_nt(
                issue_t(
                    1,
                    paper_nt(
                        paper_t('Andy','Relations',1,10),
                        paper_t('Doug','Oracle',11,20)
                    )
                ),
                issue_t(
                    2,
                    paper_nt(
                        paper_t('Mary','objects',1,10)
                    )
                )
            )
        ),
```

```
        volume_t(
            2018,
            issue_nt(
                issue_t(
                    1,
                    paper_nt(
                        paper_t('Barb','Datalog',1,10),
                        paper_t('Doug','Prolog',11,20)
                    )
                )
            )
        )
    )
);
```

Q3

a.

```
select c.name, p.title from conference c,
table(c.annual_conferences) a_c,
table(a_c.papers) p;
```

```
SQL> select c.name, p.title from conference c,
  2  table(c.annual_conferences) a_c,
  3  table(a_c.papers) p;

NAME          TITLE
----------    ----------
VLDB          Databases
VLDB          Algebra
VLDB          Calculus
VLDB          ODMG
VLDB          SQL
```

b.

```
select distinct pp.author, pp.title from conference c,
table(c.annual_conferences) ac,
table(ac.papers) pp,
table(ac.location) l, person p,
table(p.address) a
where l.city = a.city AND  p.name = pp.author;
```

```
SQL> select distinct pp.author, pp.title from conference c,
   2  table(c.annual_conferences) ac,
   3  table(ac.papers) pp,
   4  table(ac.location) l, person p,table(p.address) a
   5  where l.city = a.city AND  p.name = pp.author;


AUTHOR       TITLE
---------- ----------
Andy         Databases
Barb         SQL
```

c.

```
select pp.author, pp.title from conference c,
table(c.annual_conferences) a_c,
table(a_c.papers) pp
UNION
select i_p.author, i_p.title from journal j,
table(j.volumes) v,
table(v.issues) i,
table(i.papers) i_p
order by author, title;
```

```
SQL> select pp.author, pp.title from conference c,
  2  table(c.annual_conferences) a_c,
  3  table(a_c.papers) pp
  4  UNION
  5  select i_p.author, i_p.title from journal j,
  6  table(j.volumes) v,
  7  table(v.issues) i,
  8  table(i.papers) i_p
  9  order by author, title;

AUTHOR      TITLE
----------  ----------
Andy        Databases
Andy        Relations
Barb        Algebra
Barb        Datalog
Barb        SQL
Doug        Calculus
Doug        Oracle
Doug        Prolog
John        ODMG
Mary        objects

10 rows selected.
```

d.

```
select distinct pp.author, l.city from conference c,
table(c.annual_conferences) a_c,
table(a_c.papers) pp,
table(a_c.location) l
order by author;
```

```
SQL> select distinct pp.author, l.city from conference c,
  2  table(c.annual_conferences) a_c,
  3  table(a_c.papers) pp,
  4  table(a_c.location) l
  5  order by author;

AUTHOR      CITY
----------  ----------
Andy        Paris
Barb        Ottawa
Barb        Paris
Doug        Paris
John        Ottawa
```

Part Two

Q1

Person

```
create type location_t as object (
  city varchar2(10),
  country varchar2(10)
);
/
create type address_nt as table of ref location_t;
/
create table location of location_t;
```

```
create type phone_v AS varray(3) of char(4);
/
```

```
create type person_t as object (
  name varchar2(10),
  address address_nt,
  phones phone_v
);
/
```

```
create table person of person_t
nested table address store as address_tb;
```

Conference

```
create type paper_t as object (
  author varchar2(10),
  title varchar2(10),
  first_page integer,
  last_page integer
);
/
create type paper_nt as table of ref paper_t;
/
create table paper of paper_t;
```

```
create type location_nt as table of ref location_t;
/
```

```
create type annual_conference_t as object (
  year integer,
  location location_nt,
  papers paper_nt
);
/
create type annual_conference_nt as table of ref annual_conference_t;
/
create table annual_conference of annual_conference_t
nested table papers store as paper_tb,
nested table location store as location_tb;
```

```
create type conference_t as object (
  name varchar2(10),
  annual_conferences annual_conference_nt
);
/
create table conference of conference_t
nested table annual_conferences store as annual_conference_tb;
```

Journal

```
create type issue_t as object (
  num integer,
  papers paper_nt
);
/
create type issue_nt as table of ref issue_t;
/
create table issue of issue_t
nested table papers store as papers_tb;
```

```
create type volume_t as object (
  year integer,
  issues issue_nt
);
/
create type volume_nt as table of ref volume_t;
/
create table volume of volume_t
nested table issues store as issues_tb;
```

```
create type journal_t as object (
  name varchar2(20),
  volumes volume_nt
);
/
create table journal of journal_t
nested table volumes store as volumes_tb;
```

Q2

Person

```
insert into location values('Paris','France');
insert into location values('Ottawa','Canada');
insert into location values('Chicago','USA');
insert into location values('Atlanta','USA');
insert into location values('Toronto','Canada');
```

```
insert into person values('Andy', address_nt(), phone_v(1000,2000));
insert into person values('Barb', address_nt(), phone_v(3000));
```

```
insert into person values('Doug', address_nt(), phone_v(4000));
insert into person values('John', address_nt(), phone_v(5000));
insert into person values('Mary', address_nt(), phone_v(3000,6000));
insert into person values('Tony', address_nt(), phone_v(7000));

insert into table (
select address from person
where  name = 'Andy')
select ref(l) from location l
where  l.city = 'Paris';

insert into table (
select address from person
where  name = 'Barb')
select ref(l) from location l
where  l.city = 'Ottawa';

insert into table (
select address from person
where  name = 'Doug')
select ref(l) from location l
where  l.city = 'Chicago';

insert into table (
select address from person
where  name = 'John')
select ref(l) from location l
where  l.city = 'Atlanta';

insert into table (
select address from person
where  name = 'Mary')
select ref(l) from location l
where  l.city = 'Ottawa';

insert into table (
select address from person
where  name = 'Tony')
select ref(l) from location l
where  l.city = 'Toronto';
```

Journal

```
insert into paper values('Andy', 'Relations', 1, 10);
insert into paper values('Doug', 'Oracle', 11, 20);
insert into paper values('Mary', 'Objects', 1, 10);
insert into paper values('Barb', 'Datalog', 1, 10);
insert into paper values('Doug', 'Prolog', 1, 10);
```

```
insert into issue values(1, paper_nt());
insert into issue values(2, paper_nt());
```

```
insert into table (
select papers from issue
where  num = 1)
select ref(p) from paper p
where  p.author = 'Andy';

insert into table (
select papers from issue
where  num = 1)
select ref(p) from paper p
where  p.author = 'Doug'
and p.title = 'Oracle';

insert into table (
select papers from issue
where  num = 1)
select ref(p) from paper p
where  p.author = 'Barb';

insert into table (
select papers from issue
where  num = 1)
select ref(p) from paper p
where  p.author = 'Doug'
and p.title = 'Prolog';

insert into table (
select papers from issue
where  num = 2)
select ref(p) from paper p
where  p.author = 'Mary';
```

```
insert into volume values(2019, issue_nt());
insert into volume values(2018, issue_nt());

insert into table (
select issues from volume
where  year = 2019)
select ref(i) from issue i
where  i.num = 1;

insert into table (
select issues from volume
where  year = 2019)
```

```
select ref(i) from issue i
where  i.num = 2;

insert into table (
select issues from volume
where  year = 2018)
select ref(i) from issue i
where  i.num = 1;
```

```
insert into journal values('TODS', volume_nt());
```

```
insert into table (
select volumes from journal
where  name = 'TODS')
select ref(v) from volume v
where v.year = 2019;

insert into table (
select volumes from journal
where  name = 'TODS')
select ref(v) from volume v
where v.year = 2018;
```

Conference

```
insert into paper values('Andy', 'Databases', 1, 10);
insert into paper values('Barb', 'Algebra', 11, 20);
insert into paper values('Doug', 'Calculus', 21, 30);
insert into paper values('John', 'ODMG', 1, 10);
insert into paper values('Barb', 'SQL', 11, 20);
```

```
insert into conference values('VLDB', annual_conference_nt());
```

```
insert into annual_conference values(2019, location_nt(), paper_nt());
insert into annual_conference values(2018, location_nt(), paper_nt());
```

```
insert into table (
select location from annual_conference
where  year = 2019)
```

```
select ref(l) from location l
where l.city = 'Paris';

insert into table (
select papers from annual_conference
where  year = 2019)
select ref(p) from paper p
where p.author = 'Andy'
and p.title = 'Databases';

insert into table (
select papers from annual_conference
where  year = 2019)
select ref(p) from paper p
where p.author = 'Barb'
and p.title = 'Algebra';

insert into table (
select papers from annual_conference
where  year = 2019)
select ref(p) from paper p
where p.author = 'Doug'
and p.title = 'Calculus';

insert into table (
select location from annual_conference
where  year = 2018)
select ref(l) from location l
where l.city = 'Ottawa';

insert into table (
select papers from annual_conference
where  year = 2018)
select ref(p) from paper p
where p.author = 'John'
and p.title = 'ODMG';

insert into table (
select papers from annual_conference
where  year = 2018)
select ref(p) from paper p
where p.author = 'Barb'
and p.title = 'SQL';
```

```
insert into table (
select annual_conferences from conference
where name = 'VLDB')
select ref(ac) from annual_conference ac
where ac.year = 2019;

insert into table (
```

```
select annual_conferences from conference
where name = 'VLDB')
select ref(ac) from annual_conference ac
where ac.year = 2018;
```

Q3

a.

```
select c.name, value(p).title from conference c,
table(c.annual_conferences) a_c,
table(value(a_c).papers) p;
```

```
SQL> select c.name, value(p).title from conference c,
  2  table(c.annual_conferences) ac,
  3  table(value(ac).papers) p;

NAME          VALUE(P).T
----------    ----------
VLDB          Databases
VLDB          Algebra
VLDB          Calculus
VLDB          ODMG
VLDB          SQL
```

b.

```
select distinct value(pp).author
from conference c,
table(c.annual_conferences) ac,
table(value(ac).location) l, person p,
table(p.address) a,
table(value(ac).papers) pp
where value(l).city = value(a).city
and p.name = value(pp).author;
```

```
SQL> select distinct value(pp).author
  2  from conference c,
  3  table(c.annual_conferences) ac,
  4  table(value(ac).location) l, person p,
  5  table(p.address) a,
  6  table(value(ac).papers) pp
  7  where value(l).city = value(a).city
  8  AND p.name = value(pp).author;


VALUE(PP).
----------
Andy
Barb
```

c.

```
select value(pp).author as author, value(pp).title as title from conference c,
table(c.annual_conferences) a_c,
table(value(a_c).papers) pp
UNION select value(pp).author author,
value(pp).title from journal j,
table(j.volumes) v,
table(value(v).issues) i,
table(value(i).papers) pp;
```

```
SQL> select value(pp).author as author, value(pp).title as title from conference c,
  2  table(c.annual_conferences) a_c,
  3  table(value(a_c).papers) pp
  4  UNION select value(pp).author author,
  5  value(pp).title from journal j,
  6  table(j.volumes) v,
  7  table(value(v).issues) i,
  8  table(value(i).papers) pp;

AUTHOR      TITLE
----------  ----------
Andy        Databases
Andy        Relations
Barb        Algebra
Barb        Datalog
Barb        SQL
Doug        Calculus
Doug        Oracle
Doug        Prolog
John        ODMG
Mary        Objects

10 rows selected.
```

d.

```
select distinct value(p).author as author, value(l).city from conference c,
table(c.annual_conferences) ac,
table(value(ac).location) l,
table(value(ac).papers) p
order by author;
```

```
SQL> select distinct value(p).author as author, value(l).city from conference c,
  2  table(c.annual_conferences) ac,
  3  table(value(ac).location) l,
  4  table(value(ac).papers) p
  5  order by author;

AUTHOR      VALUE(L).C
----------  ----------
Andy        Paris
Barb        Ottawa
Barb        Paris
Doug        Paris
John        Ottawa
```