

Zadaci 1 i 2 se odnose na relacije opisane na **slici 1**. U relacije se pohranjuju podaci o zaposlenicima (**employee**) koji rade na zadacima (**task**) različitih projekta (**project**). Broj radnih sati osobe na zadatku projekta određenog radnog dana evidentira se u relaciji **employeeProjectTask**. Pojedini zadaci se obavljaju tek nakon što se obave njegovi prethodnici (**taskPredecessor**). Atributi koji čine ključeve relacija su podcrtani.

Slika 1

employee			task		project	
<u>employeeId</u>	firstName	lastName	<u>taskId</u>	taskName	<u>projectId</u>	projectName
1	Slack	David	1	Snapshot Interviews	1	CRM in Croatian Post
2	Segel	Amanda	2	Conceptual Modelling	2	HRM in HT
3	Smith	Bob	3	Physical Modelling		
4	Cardell	Ema	4	Programming		
5	Tillman	Joan	5	Testing		

taskPredecessor		employeeProjectTask				
<u>taskId</u>	predecessorTaskId	<u>employeeId</u>	<u>projectId</u>	<u>taskId</u>	workingDate	noOfWorkHours
2	1	1	1	1	09.01.2011	5
3	2	1	1	1	15.03.2011	6
4	3	4	1	3	19.03.2011	3,5
...	...	5	1	1	19.02.2011	7
		1	1	2	15.03.2011	2
		4	1	2	17.03.2011	5
		...	...	...	...	...

Zadatke 1.i 2. riješiti u skladu sa sintaksom SQL naredbi u PostgreSQL SUBP.

1. (5 bodova) Za projekt naziva 'HRM in HT' ispisati podatke o ukupnom utrošenom broju radnih sati po mjesecima i godinama u sljedećem obliku:

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2012	164.75	346.25	234.00	265.50	...	...	...	...	...	...	...	...
2013	...	...	...	...	...	...	...	...	...	...	...	...

Naputak: Upotrijebiti funkciju **crosstab**. Voditi računa da se podaci moraju ispravno ispisati i u slučaju da postoje mjeseci u kojima zaposlenici nisu radili na određenom projektu.

2. (5 bodova) Za svaki projekt ispisati podatke o zaposleniku koji je utrošio najviše odnosno najmanje radnih sati radeći na zadacima projekta u sljedećem obliku:

projectName	lastName	firstName	totWH	comment
CRM in Croatian Post	Tillman	Joan	7	minimum working hours
CRM in Croatian Post	Slack	David	20	maximum working hours
...	...	...	...	...

3. (4 boda) Pomoću osnovnog (neproširenog) modela 9 presjeka moguće je razlikovati 8 različitih topoloških relacija između **dva poligona**. Nacrtajte sliku koja ilustrira svaku od tih osam relacija te napišite odgovarajuće matrice 9 presjeka.

4. (3 boda) Navedite i objasnite tri osnovne vrste upita u sustavima koji upravljaju vremenom.

5. (3 boda) Tablici **project** iz slike 1 želimo dodati mogućnost upravljanja vremenom valjanosti. Koristeći Oracle Workspace Manager to možemo napraviti na sljedeći način:

```
ORACLE
CREATE TABLE project (
  projectId INTEGER PRIMARY KEY,
  projectName NCHAR(50)
);
EXECUTE DBMS_WM.EnableVersioning
('project', 'VIEW_WO_OVERWRITE'
, FALSE, TRUE);
```

Neka tablica **project** sadrži sljedeće podatke:

projectId	projectName	WM Valid
1	CRM in Croatian Post	1.1.2012. – 1.10.2012.
2	HRM in HT	1.4.2012. – 1.8.2012.

Što će se dogoditi ako pokušamo učiniti sljedeće (napisati sadržaj tablice **project** nakon svake od naredbi):

a) Unos novog zapisa sa preklapajućim vremenom valjanosti	b) Slijedno brisanje dijela jednog zapisa
<pre>INSERT INTO projekt VALUES (1, 'CRM in Croatian Post', WMSYS.WM_PERIOD(   TO_DATE('09-01-2012', 'MM-DD-YYYY'),   TO_DATE('11-01-2012', 'MM-DD-YYYY')) );</pre>	<pre>EXECUTE DBMS_WM.SetValidTime(   TO_DATE('05-01-2005', 'MM-DD-YYYY'),   TO_DATE('06-01-2005', 'MM-DD-YYYY'); DELETE FROM project WHERE projectId = 2;</pre>

6. (5 bodova) U bazi podataka kreirane su i napunjene sve relacije prikazane na slici 1. Dodatno su kreirani strukturirani tipovi **taskT** i **employeeT** te tipizirane tablice **taskOR** i **employeeOR** temeljene na njima. Imena stupaca koji sadrže jedinstvene identifikatore objekata u tipiziranim tablicama su **OIDtask** odnosno **OIDemployee**. Atributi od kojih se sastoji tip **taskT** odgovaraju atributima relacije **task**, a tip **employeeT** kreiran je prikazanom naredbom. U atributu **employeeT.tasks** evidentirani su različiti zadaci na kojima je osoba radila, bez obzira na kojem projektu ih je radila.

```
CREATE TYPE employeeT AS (
  employeeID INTEGER,
  firstName CHAR(50),
  lastName CHAR(75),
  tasks REF(taskT) MULTISET
  SCOPE taskOR)
INSTANTIABLE NOT FINAL
REF IS SYSTEM GENERATED;
```

Tablica **taskOR** napunjena je na temelju tablice **task**, a tablica **employeeOR** je prazna. Napisati jednu SQL naredbu kojom će se napuniti tablica **employeeOR** na temelju trenutnog sadržaja ostalih kreiranih tablica. Tablica **employeeOR** mora sadržavati podatke o svim osobama.

U zadatku se pretpostavlja korištenje SQL standarda.

7. (5 bodova) U xml datoteci **projectsAndEmployees.xml** pohranjeni su podaci o projektima i zaposlenicima odgovornima za projekt. Kreirati XML shemu za dani XML dokument. Između ostalog, osigurati sljedeće

- nije moguće evidentirati zaposlenike s jednakim identifikatorom, niti projekte s jednakim identifikatorom
- nije moguće evidentirati projekte s jednakim nazivom
- za zaposlenika odgovornog za projekt može se evidentirati samo postojeći zaposlenika

```
<projectsAndEmployees>
  <project projectId="1">
    <projectName> CRM in Croatian Post</projectName>
    <startDate>2012-11-01</startDate>
    <endDate></endDate>
    <supEmployeeId>1</supEmployeeId>
  </project>
  <project projectId="2">
    <projectName>HRM in HT</projectName>
    ...
  </project>
```

```
<employee>
  <employeeId>1</employeeId>
  <lastName>Slack</lastName>
  <firstName>David</firstName>
</employee >
<employee >
  <employeeId>2</employeeId>
  <lastName>Segel</lastName>
  <firstName>Amanda</firstName>
</employee >
</projectsAndEmployees>
```

## Rješenja:

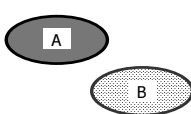
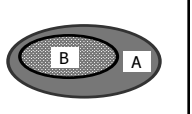
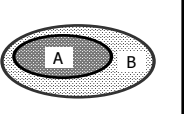
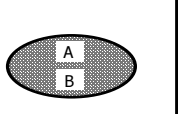
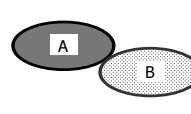
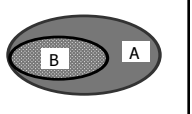
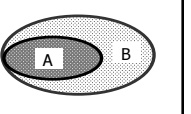
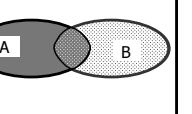
### 1. (5 bodova)

```
SELECT *
FROM crosstab
(
    'SELECT CAST(EXTRACT(YEAR FROM workingDate) AS int) AS year
        , CAST(EXTRACT(MONTH FROM workingDate) AS int) month
        , CAST(SUM(noOfWorkingHours) AS decimal) totSumWH
    FROM employeeProjectTask, project
    WHERE employeeProjectTask.projectId = project.projectID
    AND project.projectName = 'HRM in HT'
    GROUP BY year, month
    ORDER BY year, month'
    , 'SELECT monthOrdinal FROM month ORDER BY monthOrdinal'
)
AS pivotTable (year INT
    , jan decimal, feb decimal, mar decimal, apr decimal
    , may decimal, june decimal, july decimal, aug decimal
    , sept decimal, oct decimal, nov decimal, dec decimal)
ORDER BY year
```

### 2. (5 bodova)

```
SELECT projectName, firstName, lastName, totWorkingHours
    , CASE
        WHEN rankWH.maxWH = 1 THEN 'maximum working hours'
        WHEN rankWH.minWH = 1 THEN 'minimum working hours'
    END
FROM (
    SELECT projectName, firstName, lastName
        , SUM(noOfWorkingHours) totWorkingHours
        , rank () OVER (PARTITION BY project.projectID
            ORDER BY SUM(noOfWorkingHours) DESC) maxWH
        , rank () OVER (PARTITION BY project.projectID
            ORDER BY SUM(noOfWorkingHours)) minWH
    FROM employeeProjectTask, employee, project
    WHERE employeeProjectTask.employeeId = employee.employeeId
    AND employeeProjectTask.projectId = project.projectId
    GROUP BY employee.employeeID, firstName, lastName, projectName
        , project.projectID
    ) rankWH
WHERE rankWH.maxWH = 1 OR rankWH.minWH = 1
```

### 3. (4 boda)

 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} \emptyset & \emptyset & -\emptyset \\ \emptyset & \emptyset & -\emptyset \\ -\emptyset & -\emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & -\emptyset & -\emptyset \\ \emptyset & \emptyset & -\emptyset \\ \emptyset & \emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & \emptyset & \emptyset \\ -\emptyset & \emptyset & \emptyset \\ -\emptyset & -\emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & \emptyset & \emptyset \\ \emptyset & -\emptyset & \emptyset \\ \emptyset & \emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $
 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} \emptyset & \emptyset & -\emptyset \\ \emptyset & -\emptyset & -\emptyset \\ -\emptyset & -\emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & -\emptyset & -\emptyset \\ \emptyset & -\emptyset & -\emptyset \\ \emptyset & \emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & \emptyset & \emptyset \\ -\emptyset & -\emptyset & \emptyset \\ -\emptyset & -\emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $	 $  \begin{array}{c}  B^{\circ} \quad \partial B \quad B^{-} \\  A^{\circ} \begin{pmatrix} -\emptyset & -\emptyset & -\emptyset \\ -\emptyset & -\emptyset & -\emptyset \\ -\emptyset & -\emptyset & -\emptyset \end{pmatrix} \\  \partial A \\  A^{-}  \end{array}  $

#### 4. (3 boda)

- trenutni upiti – gledaju kakvo je trenutno stanje tj. stanje u trenutku pokretanja upita
- slijedni upiti – rade s podacima iz niza vremenskih trenutaka tj. iz različitih trenutaka u prošlosti, gledaju što se dogodilo i kada
- neslijedni upiti – koriste podatke iz niza vremenskih trenutaka tj. iz različitih trenutaka u prošlosti, gledaju da li se nešto uopće dogodilo, ne zanima ih kada

#### 5. (3 boda)

a) Sustav će prijaviti pogrešku, korisnik mora prilikom unosa osigurati da se intervali vremena valjanosti ne preklapaju. Sadržaj tablice će ostati nepromijenjen.

b) Obrisat će se podaci za projekt „HRM in HT“ za zadano vrijeme valjanosti. Izvan zadanog vremena valjanosti projekt „HRM in HT“ i dalje vrijedi. Dakle operacijom brisanja će se u sustav čak dodati jedna ntorka.

<i>projectId</i>	<i>projectName</i>	<i>WM Valid</i>
1	CRM in Croatian Post	1.1.2012. – 1.10.2012.
2	HRM in HT	1.4.2012. – 30.4.2012.
2	HRM in HT	1.6.2012. – 1.8.2012.

#### 6. (5 bodova)

```
INSERT INTO employeeOR
SELECT e.employeeID, e.firstName, e.lastName
MULTISET(SELECT DISTINCT t.OIDtask FROM employeeProjectTask ept, taskOR t
WHERE t.taskID = ept.taskID
AND e.employeeID = ept.employeeID)
FROM employee e
```

#### 7.

```
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="projectsAndEmployees">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" name="project">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="projectName" type="xs:string" />
              <xs:element name="startDate" type="xs:date" />
              <xs:element name="endDate" type="xs:date" nillable="true"/>
              <xs:element name="supEmployeeId" type="xs:integer"/>
            </xs:sequence>
            <xs:attribute name="projectId" type="xs:integer" />
          </xs:complexType>
        </xs:element>
        <xs:element maxOccurs="unbounded" name="employee">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="employeeId" type="xs:integer"/>
              <xs:element name="lastName" type="xs:string"/>
              <xs:element name="firstName" type="xs:string" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:key name="pkEmployee">
    <xs:selector xpath="./employee"/>
    <xs:field xpath="employeeId"/>
  </xs:key>
  <xs:key name="pkProject">
    <xs:selector xpath="./project"/>
    <xs:field xpath="@projectId"/>
  </xs:key>
</xs:schema>
```

```
<xs:unique name="uiProject">
  <xs:selector xpath="//project"/>
  <xs:field xpath="projectName"/>
</xs:unique>

<xs:keyref name="fkProjectEmployee" refer="pkEmployee">
  <xs:selector xpath="//project"/>
  <xs:field xpath="supEmployeeId"/>
</xs:keyref>
</xs:element>
</xs:schema>
```