**DBS HAND IN 3**

**Exercise 1**

1.

CREATE VIEW view1 AS SELECT \* FROM works\_on;

SELECT \* FROM view1;

2.

CREATE VIEW vie2(PROJ\_Name, PROJ\_No, PROJ\_Location, DEPART\_No, hours)

AS SELECT p.pname, p.pnumber, p.plocation, p.dnum, SUM(wo.hours)

FROM Project p, Works\_on wo

WHERE p.pnumber = wo.pno

GROUP BY p.pnumber, p.pname

ORDER BY p.pnumber;

SELECT \* FROM view2;

3.

CREATE VIEW view3(EMP\_No, EMP\_Name, PROJ\_No, PROJ\_Name, Hours, Cost)

AS SELECT e.ssn, e.fname || ' ' || e.lname, p.pnumber, p.pname, wo.hours, wo.hours \* 300

FROM Employee e, Works\_on wo, Project p

WHERE e.ssn = wo.essn AND wo.pno = p.pnumber;

SELECT \* FROM view3;

4.

CREATE VIEW view4(DEPART\_Name, MANAGER\_Name, MANAGER\_Salary)

AS SELECT d.dname, e.fname || ' ' || e.lname, e.salary

FROM Department d, Employee e

WHERE d.mgrssn = e.ssn;

SELECT \* FROM view4;

5.

CREATE VIEW view5(EMP\_Name, SUPERVISOR\_Name, EMP\_Salary)

AS SELECT e1.fname || ' ' || e1.lname, e2.fname || ' ' || e2.lname, e1.salary

FROM Employee e1, Employee e2, Department d

WHERE e1.dno = d.dnumber AND d.dname = 'Research' AND e1.superssn = e2.ssn;

SELECT \* FROM view5;

6.

CREATE VIEW view6(PROJ\_Name, DEPART\_Name, No\_of\_EMP, Hours\_per\_week)

AS SELECT p.pname, d.dname, COUNT(\*), SUM(wo.hours)

FROM Project p, Department d, Works\_on wo

WHERE p.dnum = d.dnumber AND p.pnumber = wo.pno

GROUP BY p.pname, d.dname;

SELECT \* FROM view6;

7.

CREATE VIEW view7(PROJ\_Name, DEPART\_Name, No\_of\_EMP, Hours\_per\_week)

AS SELECT \*

FROM view6 v6

WHERE v6.No\_of\_EMP > 1;

SELECT \* FROM view7;

8.

CREATE VIEW view8(EMP\_Name)

AS SELECT e1.fname || ' ' || e1.lname

FROM Employee e1, Employee e2, Employee e3

WHERE e1.superssn = e2.ssn AND e2.superssn = e3.ssn AND e3.ssn = '888665555';

SELECT \* FROM view8;

9.

CREATE VIEW view9(DEPART\_Name, No\_of\_EMP)

AS SELECT d.dname, COUNT(e.dno)

FROM Department d, Employee e

WHERE e.dno = d.dnumber

GROUP BY d.dname

HAVING AVG(e.salary) > 30000;

SELECT \* FROM view9;

10.

Create a view which contains the project name, project number, department name, department location for the projects with an average of worked hours per employee bigger than 20

CREATE VIEW view10(PROJ\_Name, PROJ\_No, DEPART\_Name)

AS SELECT p.pname, p.pnumber, d.dname

FROM Project p, Department d, Works\_on wo

WHERE p.dnum = d.dnumber AND p.pnumber = wo.pno

GROUP BY p.pname, p.pnumber, d.dname

HAVING AVG(wo.hours) > 20;

SELECT \* FROM view10;

**Exercise 2**

1.

CREATE TABLE Log\_works\_on(

ESSN CHAR (9) NOT NULL,

PNO INTEGER NOT NULL,

HOURS\_now INTEGER,

HOURS\_before INTEGER,

DAY\_TIME TIMESTAMP);

CREATE FUNCTION Log\_for\_works\_on() RETURNS TRIGGER AS $BODY$

BEGIN

IF(tg\_op = 'INSERT') THEN INSERT INTO Log\_works\_on(ESSN, PNO, HOURS\_now, DAY\_TIME)

VALUES(NEW.ESSN, NEW.PNO, NEW.HOURS, NOW());

RETURN NEW;

END IF;

IF(tg\_op = 'UPDATE') THEN INSERT INTO Log\_works\_on(ESSN, PNO, HOURS\_now, DAY\_TIME)

VALUES(NEW.ESSN, NEW.PNO, NEW.HOURS, OLD.HOURS, NOW());

RETURN NEW;

END IF;

IF(tg\_op = 'DELETE') THEN INSERT INTO Log\_works\_on(ESSN, HOURS\_before, DAY\_TIME)

VALUES(OLD.ESSN, OLD.HOURS, NOW());

RETURN NEW;

END IF;

RETURN NULL;

END;

$BODY$ LANGUAGE plpgsql;

CREATE TRIGGER Log\_insert BEFORE INSERT ON Works\_on FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_works\_on();

CREATE TRIGGER Log\_update BEFORE UPDATE ON Works\_on FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_works\_on();

CREATE TRIGGER Log\_delete AFTER DELETE ON Works\_on FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_works\_on();

2.

CREATE FUNCTION prevent\_insert() RETURNS TRIGGER AS $func$

DECLARE pcount integer;

BEGIN

SELECT COUNT(\*) into pcount

FROM Project

WHERE dnum = new.dnum;

IF pcount >= 3 THEN

RAISE EXCEPTION 'You cannot add more than 3 projects for a department';

END IF;

RETURN NEW;

END;

$func$ LANGUAGE plpgsql;

CREATE TRIGGER trigger2 BEFORE INSERT ON Project

FOR EACH ROW

EXECUTE PROCEDURE prevent\_insert();

3.

CREATE FUNCTION prevent\_insert\_wo() RETURNS TRIGGER AS $func$

DECLARE pnocount integer;

BEGIN

SELECT COUNT(\*) into pnocount

FROM Works\_on

WHERE essn = new.essn;

IF pnocount >= 4 THEN

RAISE EXCEPTION 'You cannot add more than 4 projects for an employee';

END IF;

RETURN NEW;

END;

$func$ LANGUAGE plpgsql;

CREATE TRIGGER trigger3 BEFORE INSERT ON Works\_on

FOR EACH ROW

EXECUTE PROCEDURE prevent\_insert\_wo();

4.

CREATE TABLE Log\_department(

DNAME VARCHAR (20) UNIQUE,

DNUMBER INTEGER NOT NULL,

MGRSSN CHAR (9),

MGRSTARTDATE DATE,

DAY\_TIME TIMESTAMP);

CREATE FUNCTION Log\_for\_department() RETURNS TRIGGER AS $BODY$

BEGIN

IF(tg\_op = 'INSERT') THEN INSERT INTO Log\_department(DNAME, DNUMBER, MGRSSN\_now, MGRSTARTDATE\_now, DAY\_TIME)

VALUES(NEW.DNAME, NEW.DNUMBER, NEW.MGRSSN, NEW.MGRSTARTDATE, NOW());

RETURN NEW;

END IF;

IF(tg\_op = 'UPDATE') THEN INSERT INTO Log\_department(DNAME, DNUMBER, MGRSSN\_now, MGRSTARTDATE\_now, DAY\_TIME)

VALUES(NEW.DNAME, NEW.DNUMBER, NEW.MGRSSN, OLD.MGRSSN, NEW.MGRSTARTDATE, OLD.MGRSTARTDATE, NOW());

RETURN NEW;

END IF;

IF(tg\_op = 'DELETE') THEN INSERT INTO Log\_department(DNAME, DNUMBER, MGRSSN\_before, MGRSTARTDATE\_before, DAY\_TIME)

VALUES(OLD.DNAME, OLD.DNUMBER, OLD.MGRSSN, OLD.MGRSTARTDATE, NOW());

RETURN NEW;

END IF;

RETURN NULL;

END;

$BODY$ LANGUAGE plpgsql;

CREATE TRIGGER Log\_insert BEFORE INSERT ON Department FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_department();

CREATE TRIGGER Log\_update BEFORE UPDATE ON Department FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_department);

CREATE TRIGGER Log\_delete AFTER DELETE ON Department FOR EACH ROW

EXECUTE PROCEDURE Log\_for\_department();

5.

CREATE FUNCTION prevent\_insert\_emp() RETURNS TRIGGER AS $func$

BEGIN

IF new.salary <10000 THEN

RAISE EXCEPTION 'You cannot add an employee having a salary less than 10000';

END IF;

RETURN NEW;

END;

$func$ LANGUAGE plpgsql;

CREATE TRIGGER trigger5 BEFORE INSERT ON Employee

FOR EACH ROW

EXECUTE PROCEDURE prevent\_insert\_emp();

**Exercise 3**

1.

**public** **static** **void** createTable() **throws** Exception

{

**try**

{

Connection conn = *getConnection*();

PreparedStatement create = conn.prepareStatement(

"CREATE TABLE IF NOT EXISTS Book(id INTEGER NOT NULL, name VARCHAR(50), author VARCHAR(50), PRIMARY KEY(id));");

create.executeUpdate();

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**finally**

{

System.***out***.println("Function complete.");

}

}

2.

**public** **static** **void** insertIntoTable() **throws** Exception

{

**try**

{

Connection conn = *getConnection*();

PreparedStatement insert = conn.prepareStatement("INSERT INTO Book(id, name, author) VALUES (1,'Ulysses', 'James Joyce),"

+ "(2, 'Pride and Prejudice', 'Jane Austen'),"

+ "(3, 'The Immortals', null);");

insert.executeUpdate();

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**finally**

{

System.***out***.println("Insert completed");

}

}

3.

**public** **static** **void** updateTable() **throws** Exception

{

**try**

{

Connection conn = *getConnection*();

PreparedStatement update = conn.prepareStatement("UPDATE Book SET author = 'Tamora Pierce' WHERE id = 3;");

update.executeUpdate();

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**finally**

{

System.***out***.println("Update completed");

}

}

4.

**public** **static** **void** deleteContent() **throws** Exception

{

**try**

{

Connection conn = *getConnection*();

PreparedStatement delete = conn.prepareStatement("TRUNCATE Book;");

delete.executeUpdate();

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**finally**

{

System.***out***.println("Delete completed");

}

}

5.

**public** **static** **void** dropTable() **throws** Exception

{

**try**

{

Connection conn = *getConnection*();

PreparedStatement drop = conn.prepareStatement("DROP TABLE Book;");

drop.executeUpdate();

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**finally**

{

System.***out***.println("Delete completed");

}

}

6.

**import** java.sql.Connection;

**import** java.sql.DriverManager;

**import** java.sql.PreparedStatement;

**public** **class** Main {

**public** **static** **void** main(String[] args) **throws** Exception

{

*createTable*();

*insertIntoTable*();

*updateTable*();

*deleteContent*();

*dropTable*();

}

**public** **static** **void** createTable() **throws** Exception {…}

**public** **static** **void** insertIntoTable() **throws** Exception {…}

**public** **static** **void** updateTable() **throws** Exception {…}

**public** **static** **void** deleteTable() **throws** Exception {…}

**public** **static** **void** dropTable() **throws** Exception {…}

**public** **static** **Connection** getConnection() **throws** Exception

{

**try**

{

String driver = "org.postgresql.Driver";

String url = "jdbc:postgresql://localhost:5432/postgres";

String username = "username";

String password = "password";

Class.*forName*(driver);

Connection con = DriverManager.*getConnection*(url, username, password);

System.***out***.println("Connected");

**return** con;

}

**catch**(Exception e)

{

System.***out***.println(e);

}

**return** **null**;

}

}

**Exercise 4**

Unnormalized form

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | RECEIPT |  |  |  |  |  |  |  |
| ReceiptNo | Shop | Contact | ShopDesc | Item | Cat. | ItemPrice | Amount | Total | VAT | PaymentMethod | DateTime | Message |
| 35954716 | Føtex Vejle | [www.foetex.dk](http://www.foetex.dk),  76438000 | ALLE DAGE 08.00 – 21.00,  BAGEREN ÅBNER 07.00 MANDAG-SØNDAG | BABY KARTOFLER,  BERNAISE 325G | FRUGT & GRØNT,  SLAGTER | 18,00,  15,95 | 2, 2 | 67,90 | 13,58 | Dankort | 25.04.2018, 15:40 | Tak fordi du benyttede selvscanning I føtex |

1NF

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | RECEIPT |  |  |  |  |  |  |  |
| ReceiptNo | Shop | Contact | ShopInfo | Item | Cat. | ItemPrice | Amount | Total | VAT | PaymentMethod | DateTime | Message |
| 35954716 | Føtex Vejle | [www.foetex.dk](http://www.foetex.dk),  76438000 | ALLE DAGE 08.00 – 21.00,  BAGEREN ÅBNER 07.00 MANDAG-SØNDAG | BABY KARTOFLER | FRUGT & GRØNT | 18,00 | 2 | 36,00 | 7,20 | Dankort | 25.04.2018, 15:40 | Tak fordi du benyttede selvscanning I føtex |
| 35954716 | Føtex Vejle | [www.foetex.dk](http://www.foetex.dk),  76438000 | ALLE DAGE 08.00 – 21.00,  BAGEREN ÅBNER 07.00 MANDAG-SØNDAG | BERNAISE 325G | SLAGTER | 15,95 | 2 | 31,90 | 6,38 | Dankort | 25.04.2018, 15:40 | Tak fordi du benyttede selvscanning I føtex |

2NF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | SHOP |  |  |  |
| Name | City | Website | Telephone | OpeningHours | ShopInfo |
| Føtex | Vejle | www.foetex.dk | 76438000 | ALLE DAGE 08.00 – 21.00 | BAGEREN ÅBNER 07.00 MANDAG - SØNDAG |

|  |  |  |
| --- | --- | --- |
|  | ITEM |  |
| Name | Category | Price |
| BABY KARTOFLER | FRUGT & GRØNT | 18,00 |
| BERNAISE 325G | SLAGTER | 15,95 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | PAYMENT |  |  |  |
| ItemName | Price | Amount | TotalPrice | VAT | PaymentMethod |
| BABY KARTOFLER | 18,00 | 2 | 36,00 | 7,20 | Dankort |
| BERNAISE 325G | 15,95 | 2 | 31,90 | 6,38 | Dankort |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | RECEIPT |  |  |  |
| ReceiptNo | Shop | TotalPrice | VAT | Date | Time | Message |
| 35954716 | Føtex | 67,90 | 13,58 | 25.04.2018 | 15:40 | Tak fordi du benyttede selvscanning I føtex |

3NF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | SHOP |  |  |  |
| Name | City | Website | Telephone | OpeningHours | ShopInfo |
| Føtex | Vejle | www.foetex.dk | 76438000 | ALLE DAGE 08.00 – 21.00 | BAGEREN ÅBNER 07.00 MANDAG - SØNDAG |

|  |  |  |
| --- | --- | --- |
| ITEM | | |
| Name | Category | Price |
| BABY KARTOFLER | FRUGT & GRØNT | 18,00 |
| BERNAISE 325G | SLAGTER | 15,95 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PAYMENT | | | | | |
| ItemName | Price | Amount | TotalPrice | VAT | PaymentMethod |
| BABY KARTOFLER | 18,00 | 2 | 36,00 | 7,20 | Dankort |
| BERNAISE 325G | 15,95 | 2 | 31,90 | 6,38 | Dankort |

|  |  |
| --- | --- |
| TOTAL | |
| TotalPrice | VAT |
| 67,90 | 13,58 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | RECEIPT |  |  |
| ReceiptNo | Shop | Date | Time | Message |
| 35954716 | Føtex | 25.04.2018 | 15:40 | Tak fordi du benyttede selvscanning I føtex |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Invoice No. | Contractor | Customer | Research number | Research Date | Analysis No. | Description | Amount | Price | VAT | Total Price |
| 12 | Holmsen Aps | ØKOLOGIC | 200207 | 02/01/2016 | 10,15 | Pesticide Test, Bacteria Analysis | 2,3 | 2400,  1500 | 975 | 4875 |

**Exercise 5**

***Initial form***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Invoice No. | Contractor | Customer | Research number | Research Date | Analysis No. | Description | Amount | Price | VAT | Total Price |
| 12 | Holmsen Aps | ØKOLOGIC | 200207 | 02/01/2016 | 10 | Pesticide Test | 2 | 2400 | 600 | 3000 |
| 12 | Holmsen Aps | ØKOLOGIC | 200207 | 02/01/2016 | 15 | Bacteria Analysis | 3 | 1500 | 375 | 1875 |

***1NF***

Primary key

***2NF***

Customer table

Primary key

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CustomerID | Name | ZIP Code | City | Street | House |
| C001 | ØKOLOGIC | 8700 | Horsens | Chr.Østegårds Vej | 10 |

Analysis table

Primary key

|  |  |  |
| --- | --- | --- |
| AnalysisID | Description | Price |
| 10 | Pesticide Test | 1200 |
| 15 | Bacteria analysis | 500 |

Invoice table

Foreign key

Primary key

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Invoice No. | Contractor | CustomerID | Research number | Research date | AnalysisID | Total price (no VAT) | VAT | Total price (with VAT) |
| 12 | Holmsen Aps | C001 | 200207 | 02/01/2016 | 10 | 2400 | 600 | 3000 |
| 12 | Holmsen Aps | C001 | 200207 | 02/01/2016 | 15 | 1500 | 375 | 1875 |

***3NF***

Customer table

Primary key

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CustomerID | Name | ZIP Code | City | Street | House |
| C001 | ØKOLOGIC | 8700 | Horsens | Chr.Østegårds Vej | 10 |

Contractor table

Primary key

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ContractorID | Name | ZIP Code | City | Street | House |
| CR001 | Holmsen Aps | 9990 | Fnatting | Vesterhavsvej | 25 |

Analysis table

Primary key

|  |  |  |
| --- | --- | --- |
| AnalysisID | Description | Price |
| 10 | Pesticide Test | 1200 |
| 15 | Bacteria analysis | 500 |

Research table

Foreign key

Primary key

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Research No. | Research date | AnalysisID | Amount | Total price |
| 200207 | 02/01/2016 | 10 | 2 | 2400 |
| 200207 | 02/01/2016 | 15 | 3 | 1500 |

Invoice table

Foreign key

Primary key

Foreign key

Foreign key

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Invoice No. | ContractorID | CustomerID | Research No. | Total price  (no VAT) | VAT | Total price  (with VAT) |
| 12 | CR001 | C001 | 200207 | 3900 | 975 | 4875 |

**Exercise 6**

2. DIRTY READ

Dirty read problem occurs when a transaction reads data that has been written by another uncommitted transaction running concurrently. If the former transaction executes a rollback, the latter uses data that does not actually exist.

Example on COMPANY database:

Supposing a transaction T1 increases the salary for all females with 20% but does not commit the change and another concurrent transaction T2 gets the salary for all employees and commits, then if T1 executes a rollback changing the data to its initial state, T2 will have an erroneous answer.

A picture containing object

Description generated with high confidence

3. NON-REPEATABLE READ

Non-repeatable read problem occurs when during the course of a transaction, a row is retrieved twice and the values within the row differ between reads.

Example on COMPANY database:

Supposing two transactions, T1 and T2 are interested in getting the location for department number 4, then if T1 will update the name of the location from ‘Stafford’ to ‘Sugarland’ for instance, a second attempt for T2 of reading the location will return ‘Sugarland’. In the end, there are two locations for the same department.

A picture containing object

Description generated with high confidence

4. PHANTOM READ

Phantom read problem occurs when, in the course of a transaction, two identical queries are executed, and the collection of rows returned by the second query is different from the first.

Example on COMPANY database:

Supposing two transactions, T1 and T2 are interested in getting all the information about a project named ‘ProductX’, then if T1 will delete the project, a second attempt for T2 of getting the information about ‘ProductX’ will fail, due to the fact that ‘ProductX’ does not exist anymore.

A picture containing object

Description generated with high confidence

**Exercise 7**

The first table has been referred to as T1, while the second as T2.

* Make a list with invoices which have been paid.

Using EXCEPT:

SELECT invoiceNo, customer, value

FROM T1

EXCEPT

SELECT invoiceNo, customer, value

FROM T2;

Using JOINS:

SELECT invoiceNo, customer, value

FROM T1

LEFT JOIN T2 USING(invoiceNo, customer, value)

WHERE invoiceNo IS NULL;

(left join and is null clause)

SELECT invoiceNo, customer, value

FROM T1 t1

WHERE NOT EXISTS (

SELECT \*

FROM T2 t2

WHERE ( t1.invoiceNo, t1.customer, t1.value) = ( t2.invoiceNo, t2.customer, t2.value)

);

(anti-join)

* Make a list with invoices which have not been paid.

Using INTERSECT:

SELECT invoiceNo, customer, value

FROM T2

INTERSECT

SELECT invoiceNo, customer, value

FROM T1;

Using JOINS:

SELECT invoiceNo, customer, value

FROM T2

INNER JOIN T1 USING(invoiceNo, customer, value);

(inner join)

SELECT invoiceNo, customer, value

FROM T2

WHERE (invoiceNo, customer, value) IN (

SELECT invoiceNo, customer, value FROM T1);

(semi-join)