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Факультет «Информатика и управление»

Кафедра «Системы обработки информации и управления»

Курс «БКИТ»

Отчет по лабораторной работе №7

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Задание:

Разработать программу, реализующую работу с LINQ to Objects. В качестве примера используйте проект «SimpleLINQ» из примера «Введение в LINQ».

1. Программа должна быть разработана в виде консольного приложения на языке C#.
2. Создайте класс «Сотрудник», содержащий поля:
    - ID записи о сотруднике;
    - Фамилия сотрудника;
    - ID записи об отделе.
3. Создайте класс «Отдел», содержащий поля:
    - ID записи об отделе;
    - Наименование отдела.
4. Предполагая, что «Отдел» и «Сотрудник» связаны соотношением один-ко-многим разработайте следующие запросы:
    - Выведите список всех сотрудников и отделов, отсортированный по отделам.
    - Выведите список всех сотрудников, у которых фамилия начинается с буквы «А».
    - Выведите список всех отделов и количество сотрудников в каждом отделе.
    - Выведите список отделов, в которых у всех сотрудников фамилия начинается с буквы «А».
    - Выведите список отделов, в которых хотя бы у одного сотрудника фамилия начинается с буквы «А».
5. Создайте класс «Сотрудники отдела», содержащий поля:
    - ID записи о сотруднике;
    - ID записи об отделе.

6. Предполагая, что «Отдел» и «Сотрудник» связаны соотношением много-ко-многим с использованием класса «Сотрудники отдела» разработайте следующие запросы:

   - Выведите список всех отделов и список сотрудников в каждом отделе.
   - Выведите список всех отделов и количество сотрудников в каждом отделе.

Код программы:

Member.cs

```
using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Text;

namespace LAB_7
{
    public class Member : IComparable
    {
        public int memberID;
        public string surname;
        public int departmentID;
        public Member(int m, string s, int d)

        {
            memberID = m;
            surname = s;
            departmentID = d;
        }

        public override string ToString()
        {
            return ("\nMember ID= "+memberID+"\nSurname=
"+surname+"\nDepartment ID="+departmentID );
        }
        public int CompareTo(object a)
        {
            Member p = (Member)a;
            if (p.departmentID > this.departmentID) return -1;
            else if (p.departmentID < this.departmentID) return 1;
            else return 0;
        }
    }
}
```

Department.cs

```
using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Text;

namespace LAB_7
{
    class Department
    {
        int departmentID;
        string NameOfDepartment;
        public Department(int id, string name)
        {
            this.departmentID = id;
            this.NameOfDepartment = name;
        }

        public int property_1
        {
            get { return this.departmentID;}
            set { }
        }

        public override string ToString()
        {

            return ("\nDepartment ID= " + departmentID + "\nName of department 
" + NameOfDepartment);
        }
    }
}
```

DepMemLink.cs

```
using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Text;

namespace LAB_7
{
    class DepMemLink
    {
       public int memberID;
        public int departmentID;
        public  DepMemLink(int mID,int dID)
        {
            this.memberID = mID;
            this.departmentID = dID;
        }
    }
}
```

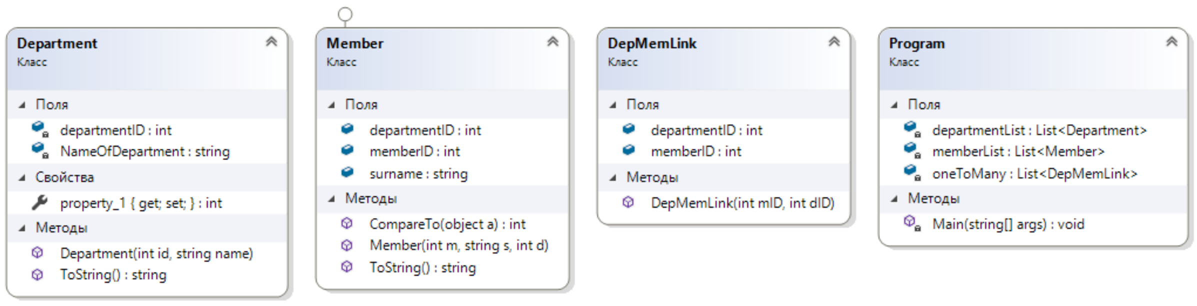
Program.cs

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace LAB_7
{
    class Program
    {
        static List<Member> memberList = new List<Member>()
        {
            new Member(1,"Kareniks",1),
            new Member(2,"Alekseev",1),
            new Member(3,"Vodka",1),
            new Member(4,"Dmitrieva",3),
            new Member(5,"Smirnov",3),
            new Member(6,"Hapov",3),
            new Member(7,"Andreev",2),
            new Member(8,"Afanasyev",2)
        };

        static List<Department> departmentList = new List<Department>()
        {
            new Department(1,"Managment Department"),
            new Department(2,"Bookkeeping"),
            new Department(3, "Purchasing Department")
        };

        static List<DepMemLink> oneToMany = new List<DepMemLink>()
        {
            new DepMemLink(1,1),
            new DepMemLink(2,1),
            new DepMemLink(3,1),
            new DepMemLink(4,2),
            new DepMemLink(5,1),
            new DepMemLink(6,2),
            new DepMemLink(7,2),
            new DepMemLink(4,3),
            new DepMemLink(5,2),
            new DepMemLink(6,1),
            new DepMemLink(7,1),
            new DepMemLink(8,3)
        };

        static void Main(string[] args)
        {
            for (int i = 0; i < 160; i++) Console.Write('#');
            Console.WriteLine("All members which are sorted by Department
ID\n");

            var allMemb = from t in departmentList
                          join s in memberList on t.property_1 equals
s.departmentID into temp
                          select new { Department = t.property_1, Member = temp
};

            foreach (var s in allMemb)
            {
                Console.WriteLine("!!!!!!!!!!!!!DepartmentID!!!!!!!!!!!! = " +
s.Department);
                foreach (var y in s.Member)
                    Console.WriteLine(y);
            }

            for (int i = 0; i < 160; i++) Console.Write('#');

//===============================================================================
==========================================

//===============================================================================
==========================================
            Console.WriteLine("\nAll members which surname starts at 'A'\n");

            var MembFirstA = from t in memberList where
t.surname.StartsWith("A") select t;
            foreach (Member s in MembFirstA) Console.WriteLine(s);


            for (int i = 0; i < 160; i++) Console.Write('#');

//===============================================================================
==========================================

//===============================================================================
==========================================



            Console.WriteLine("\nAll departments and quantity of members\n");



            var DepartAndQuantity = from a in departmentList
                                    join b in memberList on a.property_1 equals
b.departmentID into temp
                                    select new { Department = a, Quantity =
temp.Count() };



            foreach (var c in DepartAndQuantity)
            {
                Console.WriteLine(c.Department + "\nQuantity of members = " +
c.Quantity);
            }
            for (int i = 0; i < 160; i++) Console.Write('#');
```

```
//================================================================================
==========================================

//================================================================================
==========================================

            Console.WriteLine("\nAll departments, where all member's surname
starts 'A' \n");

            var DepartAllMembFirstA = (from s in departmentList
                                       from t in memberList
                                       group t by t.departmentID into g
                                       where g.All(t =>
t.surname.StartsWith("A"))
                                       select new { Department = (from s in
departmentList where s.property_1 == g.Key select s) });

            foreach (var s in DepartAllMembFirstA)
            {
                foreach (var b in s.Department)
                {

                    Console.WriteLine(b);
                }



            }

            for (int i = 0; i < 160; i++) Console.Write('#');

//================================================================================
==========================================

//================================================================================
==========================================
            Console.WriteLine("\nAll departments, where is at least one member 
which surname starts 'A' \n");

            var DepartMembFirstA = (from s in departmentList
                                    from t in memberList
                                    group t by t.departmentID into g
                                    where g.Any(t => t.surname.StartsWith("A"))
                                    select new { Department = (from s in 
departmentList where s.property_1 == g.Key select s) });

            foreach (var s in DepartMembFirstA)
            {
                foreach (var b in s.Department)
                {

                    Console.WriteLine(b);
                }



            }



            for (int i = 0; i < 160; i++) Console.Write('#');

//================================================================================
==========================================

//================================================================================
==========================================


            Console.WriteLine("\nAll departments and all members in this 
department  \n");

            var AllDepartAndMembers = (from t in memberList
                                        join r in oneToMany on t.memberID equals 
r.memberID into temp

                                        from t1 in temp

                                        group t by t1.departmentID into g


                                        from t in departmentList

                                        where t.property_1==g.Key


                                        select new {  Members=g, department=t});


            foreach (var s in AllDepartAndMembers)

                {

                for (int i = 0; i < 80; i++) Console.Write('_');

                Console.WriteLine(s.department);

                for (int i = 0; i < 80; i++) Console.Write('_');

                foreach (var f in s.Members) Console.WriteLine(f);


                }



//===============================================================================
==========================================

//===============================================================================
==========================================





            Console.WriteLine("\nAll departments and quantity of members in 
this department  \n");



            var AllDepartAndQuantityOfMemb = (from t in memberList

                                               join r in oneToMany on t.memberID 
equals r.memberID into temp

                                               from t1 in temp
```

```
                                                     group t by t1.departmentID into g

                                                     from t in departmentList
                                                     where t.property_1 == g.Key

                                                     select new { Quantity =
g.Count(), department = t });

            foreach (var s in AllDepartAndQuantityOfMemb)
Console.WriteLine(s.department + "\nQuantity of members = " + s.Quantity);



//==============================================================================
==========================================

//==============================================================================
==========================================



            Console.ReadLine();

        }
    }
}
```

Диаграмма классов:


Department
Класс
Поля
departmentID : int
NameOfDepartment : string
Свойства
property_1 { get; set; } : int
Методы
Department(int id, string name)
ToString() : string
Member
Класс
Поля
departmentID : int
memberID : int
surname : string
Методы
CompareTo(object a) : int
Member(int m, string s, int d)
ToString() : string
DepMemLink
Класс
Поля
departmentID : int
memberID : int
Методы
DepMemLink(int mID, int dID)
Program
Класс
Поля
departmentList : List<Department>
memberList : List<Member>
oneToMany : List<DepMemLink>
Методы
Main(string[] args) : void

Результаты

```
############################################################################
#####
############################################################################
#####
All members which are sorted by Department ID


!!!!!!!!!!!!!!DepartmentID!!!!!!!!!!!! = 1


Member ID= 1
Surname= Kareniks
Department ID=1


Member ID= 2
Surname= Alekseev
Department ID=1


Member ID= 3
Surname= Vodka
Department ID=1
!!!!!!!!!!!!!!DepartmentID!!!!!!!!!!!! = 2


Member ID= 7
Surname= Andreev
Department ID=2


Member ID= 8
Surname= Afanasyev
Department ID=2
!!!!!!!!!!!!!!DepartmentID!!!!!!!!!!!! = 3


Member ID= 4
Surname= Dmitrieva
Department ID=3
```

```
Member ID= 5

Surname= Smirnov

Department ID=3


Member ID= 6

Surname= Hapov

Department ID=3

###########################################################################
#####

###########################################################################
#####


All members which surname starts at 'A'



Member ID= 2

Surname= Alekseev

Department ID=1


Member ID= 7

Surname= Andreev

Department ID=2


Member ID= 8

Surname= Afanasyev

Department ID=2

###########################################################################
#####

###########################################################################
#####


All departments and quantity of members
```

```
Department ID= 1
Name of department Managment Department
Quantity of members = 3

Department ID= 2
Name of department Bookkeeping
Quantity of members = 2

Department ID= 3
Name of department Purchasing Department
Quantity of members = 3
################################################################################
################################################################################

All departments, where all member's surname starts 'A'


Department ID= 2
Name of department Bookkeeping
################################################################################
################################################################################

All departments, where is at least one member which surname starts 'A'


Department ID= 1
Name of department Managment Department

Department ID= 2
```

```
Name of department Bookkeeping

###########################################################################
#####

###########################################################################
#####


All departments and all members in this department


---------------------------------------------------------------------------
-----


Department ID= 1

Name of department Managment Department

---------------------------------------------------------------------------
-----


Member ID= 1

Surname= Kareniks

Department ID=1


Member ID= 2

Surname= Alekseev

Department ID=1


Member ID= 3

Surname= Vodka

Department ID=1


Member ID= 5

Surname= Smirnov

Department ID=3


Member ID= 6

Surname= Hapov
```

```
Department ID=3

Member ID= 7
Surname= Andreev
Department ID=2
----------------------------------------------------------------------------
-----

Department ID= 2
Name of department Bookkeeping
----------------------------------------------------------------------------
-----

Member ID= 4
Surname= Dmitrieva
Department ID=3

Member ID= 5
Surname= Smirnov
Department ID=3

Member ID= 6
Surname= Hapov
Department ID=3

Member ID= 7
Surname= Andreev
Department ID=2
----------------------------------------------------------------------------
-----

Department ID= 3
Name of department Purchasing Department
```

```
---------------------------------------------------------------------------
-----

Member ID= 4

Surname= Dmitrieva

Department ID=3


Member ID= 8

Surname= Afanasyev

Department ID=2


All departments and quantity of members in this department



Department ID= 1

Name of department Managment Department

Quantity of members = 6


Department ID= 2

Name of department Bookkeeping

Quantity of members = 4


Department ID= 3

Name of department Purchasing Department

Quantity of members = 2
```